UNIVERSIDAD COMPLUTENSE DE MADRID

FACULTAD DE PSICOLOGÍA

TESIS DOCTORAL

The role of teamwork competencies, justice perceptions and team leadership on team performance in a multicultural society

El rol de las competencias de trabajo en equipo, la percepción de justicia y el liderazgo compartido sobre el desempeño del equipo en una sociedad multicultural

MEMORIA PARA OPTAR AL GRADO DE DOCTOR

PRESENTADA POR

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DOCTORAL THESIS

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Summary

Introduction

The setting for this research is a university on the island of Trinidad in the Caribbean. This dissertation aims to explore teamwork competencies, peer justice climate and shared leadership in a cohort of Computer Science undergraduates with the intention of providing empirical evidence to support the Head of the Computer Sciences Department in understanding and improving the structure and delivery of the Software Engineering Group Project course.

Special emphasis was placed on the behavioural expression of competencies as these behaviours may simultaneously express other psychological constructs such as shared leadership and peer justice climate. Further, the variables shared leadership and peer justice climate, are meant to be calculated and investigated at the team level. Thus, it was necessary to conceptualize teamwork competencies at the group level to allow for a proper understanding of how the variable could interact with these other team level variables. The teamwork competency differential was therefore presented as a means of assessing teamwork competencies at the group level through the use of variance within the levels of teamwork competencies self-reported by each of the members of a team.

Objectives

The objective of the dissertation was to investigate the development of teamwork competencies, peer justice and leadership within multicultural groups of Software Engineering students at a local university. Two studies were carried out to gather data related to this objective:

First, a preliminary study was done to test the structural validity of the measures using confirmatory factor analyses. This was especially necessary as the selected measures had not been used before in a multi-cultural context.

Next, a main study was carried out to investigate: 1) the development of teamwork competencies, peer justice climate and shared leadership over the course of eight weeks and observe

potential connections between these variables; and 2) the relation between individual competencies and group level output variables via the introduction of the teamwork competency differential – a group level variable derived from the variance in individual levels of teamwork competencies.

Results

Results of the preliminary study showed that the Peer Justice Climate Questionnaire (PJCQ) was suitable for use in a multicultural context, however, modifications were proposed to improve the measures accuracy. The preliminary study also showed that the Teamwork Competency Test (TWCT), demonstrated its ability to detect five teamwork competencies, as well as, two major categories of competencies.

The results of the main study showed that the variables in question remained stable over the period of the main study, with small improvements to student communication and goal setting and performance behaviours. At the individual level, teamwork competencies were found to be negatively related to performance and positively related to individual perceptions of peer justice. At the team level, procedural peer justice climate moderated the relation between the teamwork competency differential for goal setting and performance management and team performance. As the peer justice climate became more positive there was a reversal of the effect of the teamwork competency differential for goal setting and performance management on team performance from a positive relation to a negative one. Also, shared leadership was found to moderate the relation between the teamwork competency differential for planning and task coordination and team performance. As the shared leadership increased there was a reversal of the effect of the teamwork competency differential for planning and task coordination on team performance from a negative relation to a positive one. The average level of teamwork competencies for each team was used as a covariable of the teamwork competency differential to examine the effects of moderating variables on its relation with team performance. Discussion was based on the implications of findings for improving the university's curriculum, developing teamwork competencies and the utility of the teamwork competency differential.

Conclusion

The results from the investigations have provided several insights into the internal happenings of the student groups involved. First, a change in the levels of teamwork competencies over the eight weeks of the course implies that the course in its current format, provides an environment for the development of teamwork competencies related to communication and goal setting and performance management.

With respect to fairness or the peer justice climate, results showed that most teams shared a healthy climate, as average team scores for each of the sub-dimensions (distributive, procedural, interactional) were above the midpoint for the measures used. Positive scores for overall peer justice perceptions reflected a climate where team members feel respected and fairly treated by their peers. The internal team environment for shared leadership was present, however, the lack of any leadership influence whatsoever may have stifled any potential for students to engage in shared leadership activities.

The data received from the main study was able to exploring the effects of the teamwork competency differential through relations that had not previously been considered. The teamwork competency differential was found to be a useful predictor of team performance. The thesis provides some evidence to support the practice of collecting data related to teamwork competency levels before persons engage in teamwork with each other. Group level analyses were limited by the size of the sample available. An ideal follow up to this dissertation would be another research study that seeks to compare teams based on different levels of the teamwork competency differential.

Resumen

Introducción

El estudio se lleva a cabo en un entorno multicultural con equipos de trabajo de estudiantes de informática de último año dentro de un contexto semiprofesional donde los equipos de trabajo deben presentar un proyecto de un diseño de Software. La intención del estudio es proporcionar evidencia empírica para desarrollar estrategias que permitan comprender y mejorar la estructura de los equipos y la presentación del curso de Proyecto de Grupo de Ingeniería de Software.

Las competencias de trabajo en equipo son relevantes para el desempeño de los equipos porque determinan los comportamientos de apoyo al trabajo en equipo. Se hace hincapié en la expresión conductual de las competencias, ya que estos comportamientos pueden relacionarse con otros constructos psicológicos, como el liderazgo compartido y el clima de justicia de equipo. Además, las variables de liderazgo compartido y el clima de justicia de equipo deben calcularse e investigarse a nivel grupal. Para ello, fue necesario conceptualizar las competencias de trabajo en equipo a nivel grupal y así permitir una comprensión adecuada de cómo la variable podría interactuar con estas otras variables en dicho nivel. Por consiguiente, el diferencial de competencias se presentó como un medio para evaluar las competencias de trabajo en equipo a nivel grupal mediante el uso de la desviación estándar de los niveles de competencias de trabajo en equipo de cada uno de los miembros de un equipo.

Objetivos

El objetivo de la tesis es analizar el desarrollo de competencias de trabajo en equipo, el clima de justicia de equipo y el liderazgo compartido en los equipos de trabajo dentro de Proyecto de Grupo de Ingeniería de Software. Se llevan a cabo dos estudios para alcanzar dicho objetivo:

Primero, se realizó un estudio preliminar para evaluar la validez estructural de las medidas utilizando análisis factoriales confirmatorios. Esto fue especialmente necesario ya que las medidas seleccionadas no se habían utilizado antes en un contexto multicultural.

A continuación, se realizó el estudio principal para investigar: 1) el desarrollo de competencias de trabajo en equipo, la justicia entre personas en equipo y el liderazgo compartido en el transcurso de ocho semanas y determinar la relación entre dichas variables con el desempeño; y 2) la relación entre las competencias individuales y las variables de resultado a nivel de grupo a través de la introducción del diferencial de competencias, una variable de nivel de grupo derivada de la variación estándar de los niveles individuales de las competencias de trabajo en cada equipo.

Resultados

Los resultados del estudio preliminar mostraron que el cuestionario de Climático de Justicia (PJCQ) era adecuado para su uso en un contexto multicultural, sin embargo, se propusieron modificaciones para mejorar la precisión de la medida. También, el estudio preliminar mostró que el cuestionario de competencias de trabajo en equipo (TWCT) demostró su capacidad para detectar cinco competencias de trabajo en equipo, así como dos categorías principales de competencias.

Los resultados del estudio principal mostraron que las competencias de trabajo en equipo y el clima de justicia de equipo se mantuvieron estables durante el desarrollo del proyecto de trabajo, con pequeñas mejoras en las competencias de comunicación y de establecimiento de objetivos y gestión del desempeño.

A nivel individual, se encontró que las competencias de trabajo en equipo estaban negativamente relacionadas con el desempeño individual y positivamente con las percepciones individuales de la justicia entre los miembros de los equipos de trabajo. A nivel grupal, los resultados encontrados indican que la percepción de justicia procedimental en los equipos de trabajo modera la relación entre el diferencial de competencias para la competencia de establecimiento de objetivos y gestión del desempeño, y el rendimiento del equipo. Es decir, a medida que el clima de justicia de los equipos era más positivo, se invierte el efecto del diferencial de competencias del trabajo en equipo para la competencia de establecimiento de metas y gestión del desempeño con respecto al rendimiento del equipo, pasando de una relación positiva a una negativa.

Por otro lado, se encontró que el liderazgo compartido modera la relación entre la diferencial de competencias en la competencia de planificación y la coordinación de tareas, y el rendimiento del equipo. Es decir, a medida que el liderazgo compartido aumenta, se produce un efecto inverso entre las variables del diferencial de la competencia de planificación y la coordinación de tareas, y la variable rendimiento de equipo pasando de una relación negativa a una relación positiva. Cabe señalar, que se utilizó como covariable del diferencial de competencias el nivel promedio de competencias de trabajo en equipo intra-equipo a la hora de examinar los efectos de las variables moderadoras en su relación con el rendimiento del equipo, pero esto no produzco ninguna diferencia en los resultados

En la discusión se exponen las implicaciones de los hallazgos para mejorar el plan de estudios de la universidad, desarrollar competencias de trabajo en equipo y la utilidad de la diferencial de competencias.

Conclusión

Los resultados derivados de esta tesis proporcionan resultados relevantes para el funcionamiento y desarrollo de los equipos de trabajo en contextos académicos cuasiprofesionales. En primer lugar, el cambio en los niveles de competencias de trabajo en equipo durante las ocho semanas del desarrollo del proyecto implica que el curso en su formato actual proporciona un entorno para el desarrollo de competencias de trabajo en equipo, en particular para la competencia de comunicación y la competencia de establecimiento de objetivos y la gestión del desempeño.

Con respecto al clima de justicia de equipo, los resultados mostraron que la mayoría de los equipos compartían un clima saludable, ya que las puntuaciones promedio del equipo para cada uno de los subdimensiones (distributiva, procedural y interacción) estaban por encima de la media de los instrumentos de medida utilizados. La existencia de valores positivos en la percepción del clima de justicia en los equipos de trabajo refleja que los miembros del equipo se sienten respetados y tratados de manera justa por sus compañeros. El ambiente interno del equipo con respecto a la percepción de liderazgo compartido estuvo presente, sin embargo, la falta de influencia de liderazgo puede haber

limitado cualquier efecto potencial para que los estudiantes participen en actividades de liderazgo compartido.

Los resultados muestran que el diferencial de competencias de trabajo en equipo es un predictor útil de rendimiento de los equipos. Los datos proporcionan alguna evidencia para apoyar la práctica de recopilar datos relacionados con los niveles de competencia de trabajo en equipo antes de que las personas participen en el trabajo en equipo entre sí. No obstante, es necesario llevar a cabo investigaciones que analicen el rendimiento de los equipos de trabajo, así como la relación entre las diferentes variables objeto de estudios en contextos profesionales. Los resultados a nivel grupal están limitados por el tamaño de la muestra disponible. Como investigaciones futuras se plantea realizar otras investigaciones en las que se compare el desempeño de los equipos en función de los diferentes niveles del diferencial de competencias del trabajo en equipo en contextos laborales.

Abstract

Three major discussions arise out of a series of investigations into a group of Software Engineering students carrying out a semester long group project. First, the dissertation investigates the development of teamwork competencies, peer justice climate and shared leadership over the course of eight weeks and observes potential connections between these variables. Second, due to the small sample of participants in the main study, a preliminary study was done before-hand using 300 participants to test the structural validity of the measures using confirmatory factor analyses. Third, the relation between individual competencies and team level outputs were tested via the introduction of the teamwork competency differential – a group level variable derived from the variance in individual levels of teamwork competencies. Data for the main study were collected from 104 undergraduate students, between the ages of 18 and 30, within 29 teams. Analyses were carried out at the individual and group levels. Results showed that the variables remained stable over the period of the study, with small improvements to student communication and goal setting and performance behaviours. At the individual level, teamwork competencies were found to be related to performance as well as other outcome variables. At the team level, procedural peer justice climate moderated the relation between the teamwork competency differential for goal setting and performance management and team performance. Also, shared leadership was found to moderate the relation between the teamwork competency differential for planning and task coordination and team performance. Discussion was based on the implications of findings for improving the university's curriculum, developing teamwork competencies and the utility of the teamwork competency differential.

Key words: peer justice climate, shared leadership, team performance, teamwork competency differential

- Chapter 1 -

Introduction

Background of Study

Computer science students consistently express their preference for working alone, despite the fact that many real-life projects require a collaborative effort. The same can be said for information technology workers in general who often times express their distress for working with others. As more organizations begin to rely on teams for achieving their targets, teamwork has become a more deeply explored area of research (Mathieu, Maynard, Rapp & Gilson 2008). The successful achievement of a team's objectives depends on a wide range of factors at the individual level, the team level and in many instances at the organizational level.

The setting for this research is a university on the island of Trinidad in the Caribbean. Within this university, the Head of the Department of Computer Sciences expressed concern for the students that graduate every cycle. The concern lied in the Software Engineering Project course, which required students to work together to develop a workable piece of software as a solution to a local problem. The Software Engineering Group Project required students to work in teams of three to six individuals. Each team was instructed to choose a project topic of their own, subject to the approval of the Head of Department; or from a list of possible projects presented to all students. A typical project for this course must involve a feasibility analysis, an analysis and specification of information systems requirements, a design solution and the specification for a specific organizational function in a real organization. Students are required to provide two major outputs for the course: 1) an individual assignment which details his or her understanding of the problematic and the recommended software process needed to address it; and 2) a working prototype of the software prepared by the team as the recommended solution to the problem as outlined in the project.

The individual assignment required each student to include: personal comments, indicating what, in his/her opinion, are the strengths and weaknesses of the approaches used, from the point of view of the specific problem solved. Students were advised to include references to relevant literature and sources of information for completing this assignment. The first assignment is primarily a test of knowledge and communication. The team assignment required student teams to include: The Systems

Design Specification; Screen Shots or samples of the User Interface; a User Manual and Project conclusions. The second assignment would evaluate the students' collaborative problem solving, coordination, knowledge and communication.

Also, all teams were required to maintain a project website which provided details on the project status, timing of team meetings, meeting attendance, action plans, discussion items, unanswered questions, decisions, and work allocations. This website was periodically perused by the Head of Department for the sake of monitoring student group activities during the semester. Although teams did not receive a separate grade for their websites, it was used as a guide for assessing group discussions and individual student contributions.

The issue with the students of the Software Engineering Group Project was that the Head of Department had an impression that there were several internal issues with the teams involved during the program. This was manifested through student complaints about working in teams. The student's issues fell into two main categories: unfair team practices and a lack of organic team leadership.

Despite the importance of technical knowledge, one of the most important aspects of working in the Software Engineering field is the ability to collaborate and work with others in a team as the majority of projects are a team effort (Lingard & Berry, 2002). The issue of leadership arose surrounding the idea that students were not inclined to act as leaders when necessary, as the Head of Department believed that too many students were depending on his leadership, and mentorship throughout the extent of the course. When questioned about if a leader should be appointed, the Head of Department's response emphasized that the most realistic scenario is one where roles are delegated based on specialization (coding, design, testing, etc) as opposed to a scenario where a leader would be appointed. As such the emergence of a leader was the preferred style of leadership development for students so as to simulate a real life scenario. Unfortunately, in the majority of instances, this was not the case.

The doctoral student, upon extensive discussions with the Head of Department, decided to design an investigation to explore various organizational variables with the intention of providing empirical evidence to support the modification of the training methods used. Peer justice climate was investigated

to determine if the complaints were arriving because students were not engaging with each other fairly. An understanding of the fairness with which students treat each other, can help determine if it would be more necessary to design interventions that were more interpersonal in nature. This type of intervention could include the education of students as to what is expected of them by others and what they in turn should expect. Next, shared leadership would be observed so as to understand the extent to which students partake in the leadership process, as well as, the likelihood for the development of shared leadership. Software Engineers, are likely to work in an environment where leadership is not centralized and as such it is necessary to develop the student's abilities to engage their colleagues and join in the leadership process. Thus, some first-hand data on the likelihood of developing shared leadership can be used as a guide for recommendations for improvement.

The doctoral student also elected to measure the levels of teamwork competencies of students as a way to connect the two other variables that were theoretically different as well as to determine the capabilities of students for working in teams. Information on student levels of teamwork competency would also help to provide a better understanding of what interventions can be recommended for students, such as including more activities in their curriculum that emphasize competency development.

As part of the doctoral programme of the Universidad Complutense de Madrid, this thesis expects to put forth a base of information that provides insight into the current state of affairs within the department and which can provide some suggestions for student development at a level that influences the concepts actually learnt throughout the semester. The results are not intended to be used to develop direct training interventions, but instead to inform the Head of Department and other academic staff of how the current undergraduate curriculum can be modified to include elements that improve on the perceived deficiencies found within procedure, structure and curriculum of the Software Engineering Group Project. This dissertation also intends to illustrate the findings of a collaboration with the Head of the Department to investigate the aforementioned factors within the Computer Sciences programme. The opportunity for data collection will also be used to explore how teamwork competencies – as an individual level construct – relates to group level variables. Specifically, the way teamwork competencies act as an input variable for various team related variables.

Linking Teamwork Competencies to Outcome Variables

Competencies can be understood as the consistent expression of behaviours within a particular domain that can be deemed as effective for carrying out activities that are essential to various jobs. In turn teamwork competencies are categorizations of behaviours necessary for successful team performance that are consistently carried out by an individual when working with others. According to Stevens and Campion (1994) There are five teamwork competencies within two subcategories: interpersonal teamwork competencies (conflict resolution, collaborative problem solving, communication) and self-management competencies (goal setting and performance management, planning and task coordination). This thesis will place a special emphasis on the behavioural expression of competencies because although competencies are used to categorize behaviours in a way that is meaningful for the context of work or preparing a job description the behaviours being categorized may simultaneously express other psychological constructs. The character given to a specific behaviour depends on what is being described. Traditionally, teamwork competencies have been used to measure team performance, thus an expansion of the range of variables that can be predicted by teamwork competencies should prove very useful for the discipline. This is, insofar, as team outcomes are theoretically based on the observance of behaviour.

The traditional conceptualization of leadership places it as an input to team performance. In these cases, leadership is conceptualized in terms of individual leader skills, abilities, and behaviours or other leader attributes (e.g., charisma) which affect team performance in some direct way (Day et al., 2004, p860). On the contrary, shared leadership theory proposes a perspective that considers leadership as an outcome of the teamwork process, an outcome which may then be used as a resource in future team processes or performance (Marks, Mathieu, & Zaccaro, 2001). Shared leadership is therefore drawn from—instead of added to—teams as a function of the processes associated with persons working together to accomplish shared work (O'Connor & Quinn, 2004).

The roles responsibilities and functions of shared leadership can be observed based on the behaviour of team members as they interact. Many of these behaviours are likely to fall within the category of behaviours categorized as teamwork competencies. For example, the teamwork competency

planning and task coordination is demonstrated through task interdependence, coordinating and synchronizing activities and information (Stevens and Campion, 1994). These behaviours are also considered to be important for the development of shared leadership (Mehra, Smith, Dixon & Robertson, 2006). Furthermore, Bennett, Wise, Woods and Harvey (2003) also suggest that a crucial dimension of preparation for shared leadership is strong teamwork skills.

Peer justice climate is another outcome variable that is important for teams, however, unlike shared leadership, it is not observed through the expression of certain behaviours. Alternatively, the peer justice climate of a team is based on the perceptions of its team members, i.e. what is interpreted by each team member as they interact with each other and observe and experience the teamwork process. When the perceptions of all team members are aggregated to the team level this is considered as the team's overall peer justice climate. As peer justice climate perceptions reflect the degree of fairness with which team members treat each other, it presumes that team members and their behaviours are the source of these perceptions. Thus, observance of one team member's behaviour is the basis for another team member's perception of fairness and subsequent action.

Teamwork competencies – as expressions of a person's knowledge, skills and abilities – can be observed by other team members. This means that as competencies are expressed through behaviours, and behaviours are observable (consciously or unconsciously) by others, then the behaviours that represent certain competencies can be observed and used to form perceptions or reciprocal actions. This can be understood more concretely using the example of interpersonal competencies. Interpersonal competencies reflect a person's ability to interact in a positive and effective manner with his or her peers (Seers, 1989). This type of behaviour has been associated with more effective teamwork because it helps to remove difficult conflict and process issues (Stevens and Campion, 1994). Similarly, an individual's interactional peer justice climate perceptions are based upon observance of the manner in which others treat him or her, i.e. respectful and appropriate interaction (Li, Cropanzano and Bagger, 2013). This type of behaviour has been associated with more positive justice perceptions, which then contribute to more effective teams through organizational citizenship behaviour (OCB) among other variables (Cardona, Lawrence, & Bentler, 2004). In this way, teamwork competencies, as expressions of respectful and appropriate team interaction can be the basis of justice perceptions.

Teamwork Competency Differential

The variables shared leadership and peer justice climate perceptions, though measured at the individual level, are meant to be calculated and investigated at the team level. Thus, it is necessary to conceptualize teamwork competencies at a group level to allow for a proper understanding of how the variable could possibly interact with these other team level variables. This, however, poses a challenge as competencies are an inherently individual concept and are not shared in anyway among team members. Although there is no theoretical basis for the existence of shared competencies among team members, there is some argument for observing how team members with different levels of competencies interact with each other.

Each individual in a team has his or her own level of teamwork competency. Thus it is important to understand that for any given team, there are persons with a range of competencies working together. For the sake of simplicity, let us suppose that each individual's level of teamwork competency is either low or high. This would imply that there may be one of three configurations of team members: 1) all team members possess high levels of teamwork competencies; 2) all team members possess low levels of teamwork competencies; and 3) team members possess a mixture of high and low levels of teamwork competencies. The cases where all team members possess either high levels or a low levels of teamwork competencies may be considered as homogeneous teams as there is little or no variance in the level of teamwork among members. On the other hand, the case wherein the team members have a mixture of high and low levels of teamwork competencies may be considered as a heterogeneous arrangement as there is likely to be a significant difference in the levels of teamwork competencies among team members. The homogeneity or heterogeneity in the level of teamwork competencies among team members creates a differential that can be the basis for making comparisons of teamwork competencies at the team level.

The teamwork competency differential is the variance in the perceived levels of teamwork competencies reported by each of the members of a team. The homogeneity (no variance) and heterogeneity (moderate to high variance) of the levels of teamwork competencies in team members may be seen as opposite ends of a spectrum along which teams can be placed. Team members are

essentially very similar in their levels of teamwork competencies or very different. The teamwork competency differential is expected to have an effect on both shared leadership and on peer justice climate perceptions as well as other team level outcome variables.

Team performance – one of several team outcomes

Team performance has been the outcome variable primarily used for testing the influence of teamwork competencies as persons with high levels of these competencies allow teams to function more effectively (Stevens and Campion, 1994; Aguado et al., 2014). The relation between teamwork competencies and performance was discussed in the work of Cooke, Kiekel, Salas, Stout, Bowers and Cannon-Bowers (2003); where the authors explained that greater team knowledge led to better team performance. Teamwork competencies operate in a similar way, where more examples of teamwork competencies are likely to increase team performance. This dissertation acknowledges the importance of team performance, however, by seeking to link teamwork competencies to other outcome variables, it intends to point attention to the various other variables that are necessary to support healthy team functioning. These various other outcome variables e.g. peer justice climate, shared leadership are play important supporting roles which contribute to on overall healthier and more productive team environment.

The benefit of linking teamwork competencies to outcome variables

Teamwork competencies and the teamwork competency differential can be measured before a team begins working together whereas shared leadership and peer justice climate, as outcome variables, must be measured afterward. As the effects of shared justice and peer justice climate can only be measured in retrospect, it would be very useful to establish an antecedent that allow for explaining their development during the teamwork process from as early as possible. This would in turn allow the Head of Department to harness the potential of output variables for influencing teamwork outcomes. For example, peer justice climate has been found to have a positive effect on organizational citizenship behaviours (Li & Cropanzano, 2008), if the teamwork competency differential was found to be important predictor of peer justice climate, then an effort can be made to improve peer justice climate through the development of teamwork competencies and modifying the teamwork competency differential. Improved levels of peer justice climate can then, in turn, brings the positive effects on organizational citizenship behaviours.

One can argue for a more direct improvement of peer justice climate, through some team level intervention, can reap the same positive benefits. This, however, can only be done by measuring levels of peer justice climate after it has developed, as peer justice climate is an outcome of the teamwork process. Alternatively, teamwork competencies as a pre-existing condition can be measured and developed before the team is established. Thus, if the teamwork competency differential is successfully identified as being related to peer justice climate, then interventions can be taken much earlier along the team life cycle. Thus, time is the most important consideration for linking the teamwork competency differential to peer justice climate, shared leadership or any other team level outcome variable. Exploring a link between the teamwork competency differential and peer justice climate or shared leadership can provide opportunities to influence the Input-Mediator-Output-Input cycle of a team, at the earliest phase instead of at the end. Also, the university's Head of Department may gain a new tool

to assist with forming teams in a more purposeful way – a way that benefits the desired outcomes instead of diminishing them.

Objectives

Structure of Research

This thesis is comprised of two studies, the first study uses a simple cross-sectional survey method to collect data from various participants and test for the validity of the measure of peer justice climate (PJCQ) and the measure of teamwork competencies (TWCT). The aim of this first study is to provide further insights into the application of the peer justice climate measure and the teamwork competency measure with a diverse sample from the Caribbean; this is considered especially necessary as these measures had not been previously used in such a context. The preliminary study also gives special emphasis to the measures used as neither of them have been used on the island of Trinidad or in a multi-cultural context. The main study aims to investigate the case of a cohort of Software Engineering students using a panel design to collect group data at the start (time 1) and end (time 2) of the semester. A panel design involves measuring some variable or variables of interest at more than one point in time from the same sample of participants. This use of multiple measures on the same variable(s) over time allows for an assessment of longitudinal changes or stability on the variables of interest (Salkind, 2010).

The Software Engineering students used in the experiment formed a part of a semester long team project in a relatively controlled teamwork environment. The course to which students belonged extended over two semesters wherein students were taught theory during the first semester and were then expected to use the second semester as an opportunity to practice integrating the concepts and techniques covered. Course objectives included: encouragement of cooperation and collective work as a team; provision of an opportunity to plan, schedule, monitor and control a software development project; application of some of the methods, tools and techniques learnt to systematically investigate and analyze an application system; design and implementation of various information procedures to assure software quality; and development of the ability to communicate a programme of work in information system development via both oral and written methods.

The setting for both studies was Trinidad and Tobago, a twin-island developing state in the Caribbean with a multi-ethnic population of approximately 1.3 million persons. The culture on these

islands is primarily a mixture of African and East-Indian with a heavy influence from British, French and Spanish cultures due to the country's colonial history. Also, the country explicitly recognizes and celebrates the multi-ethnic nature and heritage of its population (Brown & Conrad, 2007). The location of this study may be considered as unique in its nature due to: its size as a small society and; its diversity due to its multicultural character which presents an interesting representation of various cultures.

IMOI Model

The various sections of this investigation will be conceptualized theoretically using the input-mediator/moderator-output-input (IMOI) model for understanding teamwork. The IMOI model is an update of the Input-Process-Output (I-P-O) model that is intended to reflect the cyclical nature of teams (Hackman, 1987; McGrath, 1984). According to the IMOI model, team processes (P) link team inputs (I) to team related outcomes (O). For example, inputs such as the characteristics of team members or an organization's resources can be linked to team-related outcomes such as team performance and teammate satisfaction via some relevant team process. In the updated IMOI model, the dynamics between the various elements of the model were modified to reflect a more interconnected and cyclical nature of teamwork. Teams are now considered to go through a life cycle which facilitates various inputs, processes and outputs, such that an output dubbed an "emergent state" can later also act as an input. The main study intends to investigate teamwork competencies at the individual and group levels. At the individual level, it will investigate if teamwork competencies are related to various other team outcomes (Figure 1). At the team level, the IMOI model will be utilized to introduce the teamwork competency differential as an input, with the variables shared leadership and peer justice climate as emergent states that moderate the relation between the teamwork competency differential and team performance (Figure 2).

Figure 1. Model of study – relation between teamwork competencies and various outcome variables

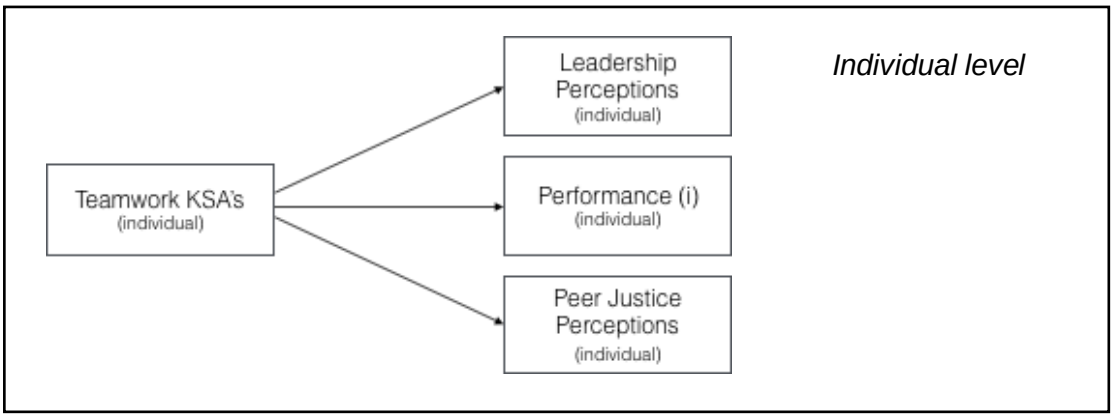
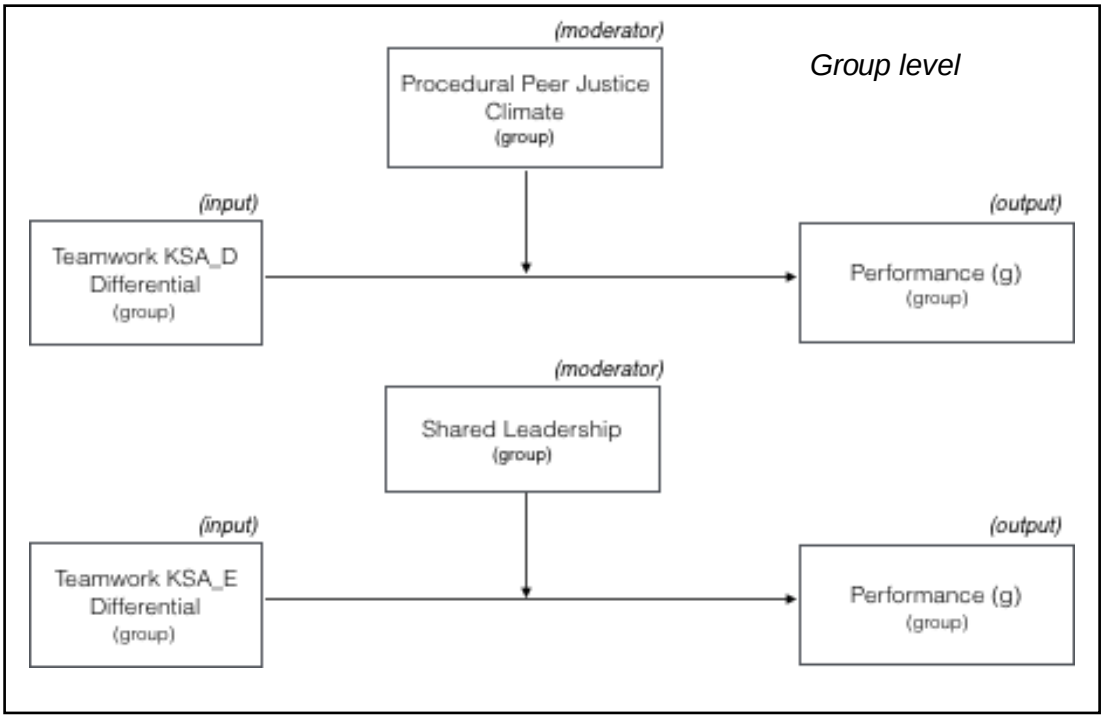


Figure 2. Model of study – role of teamwork competency differential



Individual and team level constructs

One important element of this dissertation is that it investigates variables at both the individual and group levels. Kozlowski (2013) highlights the importance of understanding constructs at different levels by explaining how individuals, teams and organizations are all a part of a multilevel system. The idea is that the behaviours that are measured are exhibited by individuals, not teams. However, when various individuals behave together, team level phenomena can be observed. Teams in turn, are nested within organizations and as such team level phenomena can be observed as having organization wide effects and implications. Research investigations should therefore ensure that team level phenomena are investigated in a way that respects their context (the organization) as well as their constituents (the individuals). In practice however, there have been instances where researchers try to attribute individual characteristics to a team collective (e.g., team personality). Though not completely unfounded, these types of assumptions place some strain on the degree of construct validity that hold together psychological theory. Any generalizations based on variables observed at the team level require precise multilevel theory and analyses to ensure validity of such team level variables (Kozlowski & Klein, 2000). Throughout this thesis, variables will be analysed at the individual level as well as the team level.

Reason for Study

My reason for this dissertation is to illustrate how necessary it is to measure teamwork competencies as an antecedent for team based research as teamwork competencies may be related to a wide range of team based constructs. Competencies, including teamwork competencies are modifiable characteristics as persons can be trained to develop their knowledge skills and abilities for working with others. If a clear link can be established between teamwork competencies and team output variables such as shared leadership and peer justice climate then more targeted efforts can be made to improve the teamwork experience. Understanding how teamwork competencies operate is at the heart of managing team behaviour in the workplace and the teamwork competency differential is a variable which can open the door to better team management and operation.

- Chapter 2 -
Literature Review

Teamwork

This dissertation adopts the definition of teams proposed by Kozlowski and Bell (2013, p. 334) who suggested that teams are "composed of two or more individuals who (a) exist to perform organizationally relevant tasks, (b) share one or more common goals, (c) interact socially, (d) exhibit task interdependencies (i.e., workflow, goals, outcomes), (e) maintain and manage boundaries, and (f) are embedded in an organizational context that sets boundaries, constrains the team, and influences exchanges with other units in the broader entity." Although some have made distinctions between groups and teams, in keeping with the research of Kozlowski and Bell, the terms *group* and *team* will be used interchangeably. Also, the definition above, though given to describe work teams specifically, will be used in this study when describing *student work teams* also called *student groups*. Researchers Andrew Li and colleagues (2013) have suggested that student work teams are analogous to real-world work teams with practical consequences for their members. Thus, in a similar fashion to the work teams in the definition above, student teams also have some notable level of interdependence and operate in an organizational context that influences their functioning. This rationale was adopted by Mathieu, Maynard, Rapp and Gilson (2008) who used laboratory teams in their teamwork research and considered these laboratory teams as work teams for similar reasons.

Team characteristics play an important role in team research as various characteristics affect performance. As such, it is important that the characteristics of the teams under observation be considered closely, so that proper assumptions can be made about results gained. According to Kozlowski and Bell (2013), the characterization of different types of teams can help pay big theoretical dividends. In their attempt to assist with categorizing teams, Kozlowski and Bell outlined various features along which teams can be distinguished based on their characteristics.

First, the external team environment or organizational context should be considered in terms of its; (a) dynamics and (b) degree of required connection to the team. Second, the team's workflow interdependence is observed with implications for its; (a) role, (b) goal, and (c) process linkages. Third, the team's membership is looked at, keeping in mind; (a) composition (ability, personality, values) (b)

diversity (demographic, geographic, associational), proximity (spatial distribution), and stability (rotation/replacement rate). Finally consideration are to be given to the team's temporal characteristics, which determine the nature of its; (a) performance episodes and cycles, (b) developmental progression, and (c) lifecycle. According to research done by Neves and Nakhai (2016) in Higher Education, the challenges faced by student teams can be put into ten categories, these categories are listed below as they share are elaborate on the same concepts outlined above for conceptualizing teams by Kozlowski and Bell (2013).

Characterization of Student groups

Student teams possess a set of unique characteristics that must be considered as these characteristics have implications for the team's performance. The first distinguishing feature of student teams is their purpose. Student teams are usually designed for the sake of learning as opposed to other teams, such as a work team, which may be set up for achieving a specific outcome such as meeting sales targets or completing a project. This is not to say that the outcome of student teams are trivial, in many instances they are relevant to students who seek to achieve good grades. Nevertheless, the completion of a project in student teams may be more of a by-product as opposed to the actual purpose of the team.

The second differing factor is task interdependence and team autonomy. Researcher Steiner (1972) studied the relationship between the tasks performed by the team members and the group output and proposed three main types of interdependence of tasks: additive, conjunctive, and disjunctive. Teams can be put into one of these three categories based on the prevalence of a particular type of task interdependence. For additive task interdependence the group's output depends on the sum of the outputs of each of its members; for instance a cleaning crew's output depends mainly on the sum of each member's work. Conjunctive task interdependence is characterized by a group output that cannot be achieved unless all team members do their parts. In these cases, team performance is determined by the least effective member. An assembly line is an example of such, wherein the team's output depends

on the teams slowest performer. Disjunctive task interdependence is often determined by one or a few members, with the level of the group's output being defined by the group's maximum performance on a few critical tasks; a research team may be considered to fall into this category, as the lead researcher's work may be most critical to the team's output. In many instances the task interdependence of teams is mixed, however, for student teams, the profile of task interdependence is most often additive with conjunctive and disjunctive tasks rarely characterizing student team assignments. Regarding team autonomy, student teams are usually self-managed yet students experience few instances of self-directing or self-governing situations in the classroom.

Third among differing factors is the division of labour. Work teams may be purposefully set up so that each member brings a specific talent or skill to the team. In this regard, the labour may be divided based along these lines, thus a team of builders may leave it to the carpenter to do a particular task and to the plumber to do another. Student teams, on the other hand, tend to have a somewhat arbitrary division of labour. Roles are not usually based on a specific knowledge or experience; and when roles are assigned they are often not based on the students' specific knowledge, skills or abilities but may be instead based on willingness or the likelihood of a particular team member to accept a task.

Teamwork skills are the fourth distinguishing factor of student teams listed by Neves and Nakhai (2016). For a team of students, proficiency is not expected in any particular skill or group of skills. Students tend to have basic teamwork skills and are therefore in the process of developing their skills. Alternatively, work teams are usually comprised of persons selected or recruited based on the skills they possess. The same can be said about knowledge or expertise; student knowledge is usually not expected to be on the same level as that of a person in a work team, and students are often given specific tasks or instructions aimed at building their knowledge base.

The fifth and sixth categories are leadership and organizational support and they are closely related, as organizational support is often helpful in solidifying the leadership role. Leadership, a major element of all teams can be quite different for a student team than for a work team. In many instances leaders are not assigned to student groups as opposed to the clear distinction given to a team lead or

director in the working context. In instances where a student assumes the leadership role, there is not likely to be any significant authority, power or rewards associated with the role of leader; conversely organizational leaders usually have some significant source of authority. Thus student teams may not likely experience the full range of dynamics associated with the leadership role. Communication between the work teams and student teams also differs; as information is available to all team members on an equal basis. Work teams on the other hand are likely to receive instructions and information from the designated team leader as the organization seeks to support the role by channelling such information through him or her.

Also linked to organizational support is the concept of coaching and formation of work teams. For a student team, coaching is limited as often times the teams exist for a relatively short time and therefore can only receive so much guidance and training. Work teams on the other hand are more likely to receive more guidance and training, with the process of training being much longer and well organized when compared to that of student teams. The effects of team coaching may be even greater in instances where team managers, supervisors or leaders are held accountable for a team's performance. The time invested in coaching and team development can be largely influenced by the length of time for which a team is set up. Thus, team life span must also count as a major difference between student teams and work teams. Student teams are usually short lived and this not only affects the time taken to coach and guide the team but also the way the team develops. A shortened team lifespan has effects on the team building process and leadership development.

Continuity is another category that distinguishes work teams from student teams. For student teams, there may be little or no continuity from one team project to another. This may be because students often change courses and teams as assignments are linked to a particular course output. Thus a student's performance with one team may not necessarily be carried forward for future work. In work teams, however, performance in a team assignment can have lingering effects. Individuals are therefore likely to consider the effects of one performance on their future assignments, career advancement and the relationship with their colleagues.

Finally, the assessment of a student team can be quite different to that of a work team. This is not to say that one is more complex or simple than the other but instead that different factors can be considered when determining team success. For a student team, apart from achieving the team's objective, there can be other aspects that may require evaluation – depending on the nature of the course and its learning objectives. The work team however, may place more emphasis on producing the team's objective, with learning objectives being secondary to overall team success.

Despite, the vast differences between student teams and work teams illustrated above, there is merit to studying student teams using similar measures as those used for work teams. The constructs investigated in this research are sufficiently robust that they are equally likely to occur in work teams as they are to occur in student teams or any other team for that matter. The perceptions measured, such as justice and shared leadership have their roots in social exchange theories that ensure that they are likely to be observed in a wide range of settings.

Teamwork Process

In an attempt to provide greater conceptual clarity as to what happens when people work together in teams, researchers Marks, Mathieu and Zaccaro (2001) took a detailed look at the concept of team process with the intention to: provide a definition of teamwork process, propose a temporally based conceptual model of team processes; introduce a new taxonomy of team process dimensions; and propose recommendations for using their taxonomy to further team process assessment in research and practice.

The researchers proceeded to define teamwork processes by differentiating it from taskwork, another important factor within the team dynamic. Taskwork was described as representing what a team does whilst teamwork processes was described as how they are doing it. The authors' main point was that teamwork processes are the members' interdependent acts that convert inputs to outcomes through cognitive, verbal, and behavioral activities directed toward organizing taskwork to achieve collective

goals (p. 357). Teamwork processes essentially capture how team members combine their individual resources, coordinating knowledge, skill, and effort to resolve task demands (Kozlowski & Ilgen, 2006).

Team processes have occupied a central role in developing theoretical models of team effectiveness (e.g., Gist, Locke, & Taylor, 1987; Guzzo & Shea, 1992; Hackman, 1983). These models have generally adopted an input-process-outcome (I-P-O) framework. In their argument to propose a temporally based model, Marks and colleagues emphasized the fact that models based on the I-P-O framework usually collect data by taking a snapshot of the various variables influencing a team at a certain point in time without actually considering that many variables, especially team performance, are greatly affected by the fact that a team works toward its goals under time constraints. Thus, Marks et, al. (2001) proposed that the common I-P-O framework used within various models.

Competencies

Talented individuals may play a large role in attaining team goals, however, the way these individuals work with each other is of equal importance. An individual's talent for doing a particular work activity are known as his or her competency. A competency may be defined in simple terms as a skill, a personal characteristic or a motive demonstrated by various behaviours (Spencer & Spencer, 1993). With respect to teams, researchers Stevens and Campion (1994) proposed that the unique demands of working in teams, the knowledge, skills, and abilities (KSAs) needed for effective performance differ from that which is needed by individuals when working alone. According to their understanding; the interaction required in team settings causes persons to draw upon a unique set of teamwork competencies, which facilitate both individual and team performance (e.g., Cooke, Kiekel, Salas, & Stout, 2003; Stevens & Campion, 1999). Teamwork competencies are an important starting point for many team processes, however attempts to create explicit links between teamwork competencies and other team based research variables has been slow for various reasons. Two of the reasons considered in this manuscript include; 1) the need for a consistent measure of teamwork competencies; and 2) the fact that various spheres of research exist in silos without deliberate attempts for cross pollination.

The exact definition of a competency in organizational psychology has varied significantly over the years since its introduction. This is not only due to the varied understanding of how the concept should be operationally defined but also due to differing understanding of the content of the construct as well as various approaches to its study. Different approaches to the study of competencies and their development have existed since the topic arose. Paramount among these are the approaches which have originated in the United States, United Kingdom, France and Germany. Research developed in unique and noteworthy ways within each of these investigative contexts. First of all, the Human Resource Development (HRD) approach was pioneered primarily in the United States as a behavioural approach to understanding competencies. In the United Kingdom, vocational education and training (VET) was developed to study competency; meanwhile in European countries the Personal Skills Card and the

European Skills Accreditation System were developed to acknowledge and support non-formal learning policies, in order to identify and validate competencies. Despite the varying understandings of competencies, that were proposed due to a variety of practices in each part of the world, there are several similarities to be explored.

Origins of competency research

Prior to the 1970s, the predominant opinion for determining the ability of an individual was to rely on performance in aptitude tests, such as the Scholastic Aptitude Tests. The premise was that aptitude test scores were highly correlated with grades in school. As this relation was highly verifiable (e.g. McNemar, 1964), there was little resistance of this approach until the seminal work of researchers Thorndike and Hagen (1959), which illustrated that reliance on aptitude test, as a measure for successful performance was misleading.

Although various authors demonstrated that mental ability is the best predictor of professional success (e.g. Bertua, Anderson & Salgado, 2005; Salgado, Anderson, Moscoso, Bertua, De Fruyt & Rolland, 2003), an alternative argument by Thorndike and Hagen (1959) emphasized that there was no significant correlation between aptitude test scores and various measures of later occupational success. Their assertions were made via research involving over 10,000 respondents for 12,000 correlations. Later, the work of Holland and Richards (1965) demonstrated that academic and non-academic accomplishment are relatively independent dimensions of talent by showing that there was no consistent relationship between scholastic aptitude test scores in students and their actual accomplishments in social leadership, the arts, science, music, writing, and speech and drama from a sample of 7,262 college freshmen attending 24 colleges and universities. Similarly, Elton and Shevel (1969) compared student's aptitude test scores to their scores on a non-academic achievement scale. They concluded that there was no significant relation between academic talent and any non-academic talents, thus supporting the notion that grades at school were not related to other behaviours of importance. Performance should then be quantified or inferred via other means than the use of academic or aptitude testing.

In 1973, David McClelland, Professor of Psychology at Harvard University reinforced the disconnect between academic ability and performance on the job. McClelland's research paper, 'Testing for Competence Rather than Intelligence' also went further as to question the reliability of intelligence tests as a predictor of job success. The paper suggested evidence that the popularly referenced correlation between intelligence test scores and job success may have actually been due to a their joint association with socio-economic status. Therefore, students who do well on academics, on aptitude tests and are also successful in life, may have already been predisposed to do so due to the economic circles within which they operate.

According to McClelland (1973), competencies or enduring personal characteristics were the best predictors of on-the-job performance and therefore if one wanted a test for on-the-job performance, one would have to develop a test for this based on the job that was to be done. For example, McClelland stated that if one wanted to know how well a person can drive a car, then one should sample his ability to do so by giving him a driver's test or several types of driving tests as opposed to a paper-and-pencil test about following directions, or a test of overall intelligence, etc. Therefore, tests would be less related to general aptitude and more concerned with specific competencies.

The challenge with McClelland's proposal was that it would mean the development of a specialized test for each and every profession that exists. As a solution to this challenge it was proposed that certain more generally useful competencies be identified. The competencies would be the ones that were considered common across various occupations in various industries. Competencies such as communication, leadership, and organization skill may be as useful for a bank manager as it would be for a medical consultant or a factory supervisor and as such tests could be made for these competencies.

McClelland's work, though originating in the realm of education and academic achievement, soon opened the door to a body of research in the business sector, as it was keen to capitalize on being able to reliably measure on-the-job performance. McClelland's own company, known as McBer and Company, alongside another company known as The Hay Group went on to carry out over 30 years of global competency research across several cultures and industries (Chouhan & Srivastava, 2014) with

the intention of understanding worker performance and devising ways of improving (Hay Group et al., 1996). Around the same time, the work of another researcher, Richard Boyatzis, demonstrated great significance. Boyatzis' pioneering study, 'The Competent Manager' (1982) played a major role in bringing the concept of competencies to the business world. Thus, the behavioural approach gained a foothold in the realm of organizational research, through the consistent studies carried out by consultants attempting to increase worker productivity.

Behavioural Approach

Originating in the United States, the human resource development or behavioural approach is marked by its focus on job-related (functional) competencies and associated behavioural competencies (Aragon and Johnson, 2002; Boon and van der Klink, 2002). This approach, as explained above, came out of a shift away from assessing persons based on cognitive abilities to assessing them based on behaviours expressed under job related conditions (McClelland, 1973). In this context, an early definition of a competency was made. Competencies were seen to be underlying characteristics that were related to effective or superior performance on the job. Furthermore, these characteristics were understood to be consistent across situations and endured for a relatively long period of time (Boyatzis, 1982; Spencer and Spencer, 1993).

Boyatzis, in his 1982 book *The Competent Manager*, presented an intensive study that provided a context for identifying competencies or 'special characteristics', as well as assessing and developing managerial talent. The research is the origin for this definition of a competency as, 'an underlying characteristic of a person which results in effective and/or superior performance in a job' and identified 19 generic competencies organized into five distinct clusters - which were; goal and action management, leadership, human resource management, directing subordinates, and focus on others. Boyatzis' definition of a competency as an underlying characteristic was inspired by the earlier work of George Klemp (1980) who conceptualized them in the same way. The definition subscribed to by these two researchers isn't completely synonymous with what was initially proposed by McClelland,

however it managed to capture the implicit idea. This variation in defining a competency seems to repeat itself across the years as research developed within both the academic and business contexts of the United States.

In 1989, researchers Hornby and Thomas, Jacobs and Hogg begin to define competencies in terms of skills and abilities. In research related to management performance, Hornby and Thomas define them as "the ability to perform effectively the functions associated with management in a work situation." Jacobs walks along a similar line describing them as "observable skill or ability to complete a managerial task successfully," whilst Hogg revisits the idea of competencies as, "the characteristics of a manager that lead to the demonstration of skills and abilities." Hogg, however, included the idea that said skills and abilities are *transferable* - a noteworthy addition. The years that followed, saw further consideration of skills and abilities as integral components of defining a competency (e.g. Spencer and Spencer, 1993; Woodall and Winstanley, 1998).

Tucker and Cofsk (1994) outlined five major components of a competency as: knowledge, skill, self-concept, traits; and motives. They went on to describe these components by using the example of a surgeon. The surgeon's *knowledge* refers to his information and learning such as the knowledge of human anatomy. *Skill* refers to the surgeon's ability to perform certain incisions or other surgery related techniques. The *self-concept* encompasses the surgeons attitudes, values and self-image, which can be displayed through a surgeon's confidence in carrying out a particular procedure. The surgeon's *traits* refers to physical characteristics and consistent responses to certain situations such as eyesight, steady hands and ability to remain calm under pressure. Finally, the surgeon's *motives* refer to the emotions, desires or other impulses that cause the surgeon to act in a certain way. According to these researchers, motives and traits are what can cause a person to carry out their job without close supervision; whilst the person's knowledge, skill and attitude determines their level of performance (Tucker and Cofsk, 1994).

In the recent years, new meanings and labels have evolved through common usage for the term competence and competency (Strebler et al., 1997). One of the most often used definitions for

competencies is that; Competencies include the collection of success factors necessary for achieving important results in a specific job or work role in a particular organization. Success factors are combinations of knowledge, skills, and abilities (more historically called ―KSA‘s) that are described in terms of specific behaviours, and are demonstrated by superior performers in those jobs or work roles (Vikram Singh Chouhan & Sandeep Srivastava, 2014, p. 16). Thus, whilst the behavioural approach to competency research is still heavily influential in the US, a broader conception of competence which emphasizes, also job-related functional skills and underpinning knowledge, has been gaining ground.

In a more recent series of research by Bartram and colleagues (Batram, 2001; Bartram, Robertson, & Callinan, 2002; Kurz & Bartram, 2002) a model of performance was proposed, which defines eight broad competency factors dubbed *The Great Eight*. The Great Eight competencies emerged from factor analyses and multidimensional scaling analyses of workplace performance, as opposed to the more traditional predictors of competency, i.e., ability tests. This "criterion based" model as opposed to the typical "predictor based" model provide an alternative way to explore the validity of various potential predictors of workplace performance.

Functional Approach

The United Kingdom's competence based approach was functional in nature as it placed its emphasis on the ability of a worker to demonstrate the standards required of employment within the work context (Knasel and Meed, 1994). During the 1980s, the United Kingdom (UK) government supported efforts to make a nation-wide system of work-based qualifications, by introducing a competency-based approach to vocation education training (Le Deist & Winterton, 2005). This competency-based approach to education required an assessment of the competencies or job skills needed in the workplace, thus a framework of occupational standards of competence was developed (Mansfield and Mitchell, 1996).

The vocation education training (VET) system was developed as a response to deficiencies of skill formation throughout the UK. Based on occupational standards of competence, the system aimed

to be grounded in functional analysis of occupations in a variety of contexts (Mansfield and Mitchell, 1996). Occupational standards, rooted in real work contexts were identified by employers and trade unions, and used to identify certain key roles that required competency (Mansfield, 1993). The key roles were then broken down into these various competencies which were then each divided into elements of a competence. For each element of a competence performance criteria were defined and used as a basis for assessment, with range indicators provided to guide assessment.

The definition of competence coming from the functional approach is 'the ability to apply knowledge, understanding and skills in performing to the standards required in employment. This includes solving problems and meeting changing demand.' (Beaumont, 1996). This definition, included a mix of models such as work expectations, input measures (knowledge and skills) and psychological attributes (Mansfield & Mitchell, 1996, p. 46). There was however some argument that despite its polished and systematic approach, the functional approach in its early stages seemed to be without significant theoretical support to ground it.

Although the functional approach is primarily used throughout the UK, there have been instances where employers have chosen to either; develop their own competence frameworks; adopted other generic models (Carrington, 1994; Hirsh and Strebler, 1994): or opt to use the Hay McBer competency framework prevalent in the United States (Mathewman, 1995; Cockerill, 1989). The diversity of methods used to measure and develop competencies provides a means to the blending of different approaches. In fact, evidence provided by (Winterton and Winterton, 2002) on the methods of competency development used by various organizations revealed that the concept of competence has been broadened to capture underlying knowledge and behaviours rather than simply functional competencies associated with specific occupations (Le Deist & Winterton, 2005).

Other significant approaches

Two other noteworthy approaches to competency assessment and development can be seen in France and Germany. First, the French approach began during the 1980s, and became particularly

influential from the 1990s when the state's employment agency, ANPE (Agence nationale pour l'emploi) changed its framework of occupations (Répertoire Opérationnel des Métiers et des Emplois) to a competence based system (Le Deist & Winterton, 2005; Le Boterf, 1994). These changes were considered by various academics as the root cause for the distinct features of competency management in the French state.

One of the primary differences of the French approach to the US approach, according to Gilbert (2003), is the element of national culture within the way competencies are managed. In this context, persons had a right to vocational training and collective agreements played a greater influence on the way persons were assessed. Thus, the McClelland approach, an approach driven heavily by the practices of the private sector, has been utilized to a far lesser extent. Also, the system in France differentiated itself from the UK system in the way companies evaluated competencies; individual evaluation was more prevalent as opposed to a state driven method of determining qualification (Arnaud and Lauriol, 2002). Despite the differences, there are several significant similarities between the French approach and both the US and UK approaches. Akin to the behavioural (US) and functional (UK) approaches, the French approach considers behavioural competencies as well as functional competencies; even going on to acknowledge the importance of an individual's knowledge. Dejoux (1999) commented that in France, the notion of individual competence had not yet generated a general, empirically validated theory, however, there is consensus around three main concepts that can be seen as similar within the other approaches. These three concepts are; knowledge (savoir and connaissance), experience (savoir faire or savoir agir) and behaviour (savoir eˆtre or la faculté de s'adapter).

At its inception, the German approach differed in a significant way to the above approaches in that it emphasized the inputs needed to form competencies rather than the outcomes needed to do a particular job. Another unique trait of the German approach is its preference for competencies that were closely linked to a particular job as opposed to generic or transferable competencies - which were seen as having the potential to damage the unity of a craft (Le Deist & Winterton, 2005). The German education system eventually moved beyond this focus on inputs to focus on outcomes or competency.

Thus, the term *kompetenz* or competence referred to the capacity of a person to act and comprises the content or subject knowledge and ability, as well as core and generic abilities (Arnold et al., 2001, p. 176).

Each of the four approaches mentioned above has its own strengths. The behavioural approach used in the US has done well to highlight the importance of individual characteristics and the use of behavioural competence to develop superior performance. Whilst the functional approach of the UK has shown the value of occupationally defined standards and their utility in the workplace. Finally, the approaches adopted in France and Germany are considered to hold the potential for developing into multi-dimensional perspectives of competence. As each approach develops in its own way, they seem to grow more similar to each other.

Globalization allows for more collaboration among researchers, and as multinational companies spread across the globe it is expected that there will be an eventual exchange of ideas between the various approaches. Though each approach has had its unique origin and context from which it has developed, the pursuit of improvement has led to the expansion of the understanding of the concept of competency by each of the approaches. Thus, previously narrower definitions for competency have been expanding leading to significant overlap in understanding the concept. This path can, with time, pave the way for a holistic typology that will be more useful in understanding the combination of knowledge, skills, abilities and behaviours that are necessary for particular occupations (Le Deist & Winterton, 2005).

Categories of competencies

Various holistic models have developed for understanding where each type of competency fits in relation to the others. There are a few such *holistic models* of competencies that are meant to distinguish various types of competencies. Katz and Kahn (1986) grouped competencies into four areas: *technical competencies* – which include those related to the technology or function needed to perform in a particular job; *managerial competencies* – which included the ability to plan organize and mobilize

resources on the job; *human competencies* – those which involved the skills needed to motivate and develop other persons; and *conceptual competencies* – those which involve the ability to think at the abstract level and use this thinking from planning on the job. These four groups of competencies have been organized from the perspective of the individual, with each category being determined by considering roles played by an individual, i.e. technical, managerial, human and conceptual.

Alternative to the individual perspective demonstrated above, Carrol and McCrackin (1988) chose to develop a form of classifying competencies from an organizational perspective. In this perspective, each category of competency is linked to a need of the organization, these categories include: *core* or strategic competencies, *leadership* or managerial competencies, and *functional* competencies. Core competencies refer to the elements of behaviour that are important for all employees. Leadership competencies are related to leading and organizing persons. Functional competencies are job-specific skills required to perform a particular role. Though both the individual and organizational perspectives for categorizing competencies are similar in nature, the key difference of each perspective is the way in which the competencies are described. For instance, competencies related to management are described by the individual method as 'the skills needed to motivate and develop other persons' whilst the organizational method of classifying competencies describes management competencies as 'related to leading and organizing'.

Later, Cheetham and Chivers (1996, 1998) proposed a competence framework with five dimensions: cognitive competencies, functional competencies, personal competencies, ethical competencies and meta-competencies. Within this framework, cognitive competency includes the informal and tacit knowledge gained through experience. Functional competency refers to the skill or know how of a person in a specific work area. A personal competency is considered to be a 'relatively enduring characteristic of a person causally related to effective or superior performance in a job'. An ethical competency is the appropriate personal and professional values and the ability to make sound judgement within the work context based upon these values. Finally, meta competencies refer to the ability to cope with uncertainty, as well as with learning and reflection.

Most recently, various studies from around the world have shown the following three categories of competencies: cognitive competencies, such as systems thinking and pattern recognition; emotional intelligence competencies, such as emotional self-awareness and emotional self-control; and social intelligence competencies, such as empathy and teamwork. These, however, are not in any way a universal list but are considered to be the competencies that differentiate outstanding performers from average ones (Bray, Campbell & Grant, 1974; Boyatzis, 1982; Kotter, 1982; Luthans, Hodgetts & Rosenkrantz, 1988; Howard and Bray, 1988; Spencer and Spencer, 1993).

One interesting point to note of the various models for illustrating categories of competencies, is that there is no explicit mention of competencies related to working in teams. One reason may be that teamwork itself has only recently become a foundational part of organizations. The next section goes on to discuss teamwork competencies specifically.

Teamwork Competencies

Teamwork competencies consists of the knowledge skills and abilities which persons enlist to contribute to a team in a more productive and effective way. The most popularly cited literature on teamwork competencies have divided them into two major categories. First there are those researchers like Larson and LaFasto (1989); Stevens and Campion (1994); and Cannon-Bowers, Tannenbaum, Salas and Volpe (1995) who all seemed to view teamwork competencies as a personal skill possessed by members of a group, which goes on to affect success. Next, there are those such as Benne and Sheats (1948) who believed that teamwork competencies were related to *group roles* - thus the success of the teams is dependent on how well these roles are recognized and assumed (Neves & Nakhai, 2016).

Within the category of researcher that considered teamwork competencies as being related to the individual, researchers Larson and LaFasto (1989) proposed a list of attitudes and behaviours essential for effectively working with others. In cases of effective teamwork an individual is likely to display the following: an understanding of their roles, objective and fact-based judgements, collaborative work, concern for the team's goals over personal ones, generosity with sharing information, helpfulness to others, maintenance of high personal standards, confidence in the face of issues, leadership to others when necessary, and positive response to constructive feedback. This list of attitudes and behaviours had some influence on research on teamwork competencies that followed.

In 1994, Stevens and Campion (1994) developed theoretical arguments and resolutions concerning a set of KSA factors that they believed would identify individuals with high levels of teamwork capabilities. Through a search of sociotechnical systems theory, organizational behaviour literature, and social psychology, they inferred a set of individual-level competencies that would be effective within teamwork situations. These competencies were set within two domains. For the first domain, called Interpersonal KSAs, Stevens and Campion posited that team effectiveness would rely heavily on the ability of its individuals to successfully manage and create amicable interpersonal relations with others in the group. Hence, individual levels of Interpersonal KSAs should be strongly associated with team performance. Within the domain of Interpersonal KSAs, three competencies were

identified that related to team members' abilities to handle interpersonal issues: conflict resolution skills (including KSAs such as recognizing types of conflict and encouraging useful conflict); collaborative problem-solving skills (implementing the appropriate amount of participative problem solving); and communication skills (understanding open communication methods). The second domain identified by Stevens and Campion as important to successful teamwork was called Self-Management KSAs. Although the keeping of good relationships within the team should make for comfortable interactions between members, the researchers suggested that team members also needed self-management competencies to be able to direct their actions and to execute assigned tasks. They selected two Self-Management KSAs they thought critical to teamwork: goal setting and performance management (knowledge of goal setting and feedback), and planning and task coordination (coordinating team member activities). These in total, make up five teamwork competencies within the two domains of interpersonal and self-management KSAs that are critical to creating high team performance. Stevens and Campion's research indicates that each of these capabilities is likely to be important to producing a well-completed team project and that selecting individuals for teamwork situations who have tested high on these KSAs should result in more effective groups (Table 1).

A year later, in a similar line of research to Stevens and Campion the researchers Cannon-Bowers, Tannenbaum, Salas and Volpe identified eight teamwork competencies necessary for effective teamwork. These competencies are as follows: adaptability - the use of information to create strategies for meeting its objectives; shared situational awareness - a compatible understanding of the environment and situations and the shared sense of how to handle such situations; performance monitoring and feedback - the reciprocal process of giving and receiving feedback; leadership and team management - the coordination and motivation of team members through insight; interpersonal relations - the maintenance quality interactions with team members; co-ordination - the organization of resources and activities for optimum results; communication - the exchange of information in a clear and respectful manner; decision making - the selection of appropriate avenues for action when necessary (Cannon-Bowers et al., 1995).

As an alternative to those theories that consider teamwork competencies as originating in the individual, are those that consider teamwork competencies as related to *group roles*. Key among this category of research is the work of Benne and Sheats (1948) on leadership competencies within the team. For these scholars, competencies are related to the group roles that team members are required to play. As such the required role of leader can be understood in terms of various team skills or behaviours linked to the role: These team skills or behaviours can fall into either of two categories; task management skills such as organizing and information seeking, or interpersonal skills such as motivating and setting standards. Therefore, one or various team members can be seen to fill the leadership role as they express these skills or carry out these behaviours based on their awareness of what needs to be done and their ability to do it.

Between these two most influential trains of thought this research leans more exclusively on the first for its basis on the individual. A theory of teamwork competencies that is based on the behaviour of individuals provides for a more direct link with other constructs that can be conceptualized at the individual level. This is because a more direct link can be made between the occurrence of behaviours linked to the successful participation in team task and behaviours linked to such concepts like peer justice or shared leadership. Further, the group role perspective proposed by Benne and Sheats (1948) seems to consider skills and behaviours that fall into the categories of teamwork competencies proposed by Stevens and Campion.

Table 1: List of teamwork competencies

Interpersonal KSAs

1. Conflict Resolution

- Recognize team conflict.
- Recognize type and source of conflict and implement conflict resolution strategies.
- Employ integrative (win-win) negotiation strategies.

2. Collaborative Problem Solving

- Identify situations requiring participative group problem solving.
- Recognize the obstacles to collaborative group problem solving and implement corrective actions.

3. Communication

- Understand communication networks and utilize decentralized networks to enhance communication.
- Communicate open and supportively.
- Listen in a non-evaluative way and use active listening techniques.
- Maximize consonance between non-verbal and verbal messages, and recognize and interpret the non-verbal messages of others.
- Engage in ritual greetings and small talk.

Self-Management KSAs

4. Goal Setting and Performance Management

- Establish specific, challenging and accepted team goals.
- Monitor, evaluate, and provide feedback on both overall team performance and individual performance.

5. Planning and Task Coordination

- Coordinate and synchronize activities, information, and task interdependences.
- Establish task and role expectations of individual team members, and ensure proper balancing of workload in the team.

Measuring Teamwork Competencies

The teamwork knowledge skills and abilities test (TWKSAT) has been one of the most significant and recognizable contributions made by researchers Stevens and Campion (1999). The instrument is aimed at providing practitioners and academics with the means of measuring teamwork competencies in individual team members. The, easy-to-use, instrument consisting of 36 items, the TWKSAT has been found to predict performance based on teamwork competency scores with significant validity. The measure has been used as a tool to assess training deficiencies and was even found to be sensitive to changes in competency levels in students after their participation in training programmes (McClough & Rogelberg, 2003).

Though the TWKSAT has found its niche within the field of organizational psychology as a tool for measuring teamwork competencies, there have been shortcomings surrounding its use and the ability of researchers to replicate the results of initial research (Aguado et al., 2014). Evidence by McClough and Rogelberg (2003) showed the TWKSAT as having good predictive validity, but needing improvement in terms of reliability (e.g., Athanasaw, 2003; Chen et al., 2004). Despite the TWKSAT's relevance as an appropriate measure of essential teamwork competencies, the absence of studies examining the causes of these reliability issues surprised researchers Aguado and colleagues (Aguado et al., 2014). By means of three studies, Aguado et al. (2014) highlighted significant limitations in the original TWKSAT designed by Stevens and Campion (1999), proposed improvements to the metric characteristics of the test, and developed a new version for measuring teamwork competencies known as the Teamwork Competency Test (TWCT).

The original measure was shown to have three main weaknesses. The first weakness was that test items showed very low reliability indices affecting the general reliability of the scale. This was determined by having independent experts evaluate whether the items within the measure truly reflected the competencies indicated (a method proposed by Rovinelli and Hambleton in 1977). This was followed by the creation of an index to determine how well each question reflected the competency it

was supposed to measure. The method's results indicated that several of the questions did not meet the researcher's threshold for inclusion' and were thus poor measures of their respective competencies.

The second issue, linked to the first, was that the competencies that were supposed to be measured by the items of the TWKSAT were not fully represented in the test. Specifically, the competency linked to; i) recognizing the type and source of conflict confronting a team, and, ii) implementing an appropriate conflict resolution strategy. These competencies were not considered to be represented by any questions on the measure. Similarly, the competencies linked to; i) the understanding of communication networks, and ii) the utilization of decentralized networks to enhance the communication; were also not represented. This lack of representation for certain competencies was discovered using the same method implored for the first issue. There was in each case an inaccurate representation of the competency by the questions asked, evidenced by low indices reflecting this relation.

The third major issue related to the use of the TWKSAT was that the dimensional structure obtained from a factor analysis was not well aligned with the proposed substantive model. This meant that the questions used for testing competencies, and the competencies meant to be tested did not align themselves well with the intended structure originally described. In response to this finding, Aguado et, al. (2014) conducted various exploratory factor analyses which resulted in various factor mappings that represented the data more accurately.

The attempt of Aguado and colleagues to revise the TWKSAT resulted in the creation of the Teamwork Competency Test (TWCT). A new measure which is based on the TWKSAT but improves on the shortcomings of the original with better reliability and validity. The TWCT is made up of 36 items, drafted in "observable behaviors" statements and using a 4-point frequency scale format for indicating responses. The test has so far been used only to a limited extent, however there have been examples of its reliability. Finally, the creators placed special emphasis on ensuring that the questions within the measure were considered as accurate representations of the competencies it intends to test. When put through a factor analysis, the dimensionality of the TWCT reproduces the substantive model

originally proposed by Stevens and Campion (1994) much better that the TWSKAT. Thus, the TWCT gives a better reflection of the five dimensions of teamwork competencies within persons tested. This according to the authors of the new measure, “allows for differential analysis of the effects of specific competencies on the performance of different types of teams and makes possible the examination of whether improving the skills associated with a specific teamwork competency benefits the others.” (Aguado et al., 2014, p. 116).

Organizational Justice

Within the realm of organizational research, organizational justice describes the behaviours and attitudes persons develop in response to how fairly they perceive their workplace (Li, 2008; Cropanzano, Byrne, Bobocel, & Rupp, 2001; Moorman, 1991). This section outlines the fundamentals of organizational justice research. Beginning with the early examples of fairness theory, it moves on to describe how various dimensions of justice were uncovered and supported through further research. Afterward, attention is given to a more recent expansions of justice theory; *peer justice climate*, the degree of fairness with which team members treat each other. An outline is then given of some salient research on team performance and its relation to organizational justice. Finally, the chapter is concluded by proposing some theoretical links between peer justice climate and teamwork competencies.

Justice in a very basic sense is about people getting what they deserve, or about fair treatment for all involved. Fairness is a major theme at the heart of the legal foundations of a state, the basis for trade within and between organizations; and the various personal beliefs held by individuals. Having to do with receiving as one gives, or being rewarded due to one's effort; the idea of a just system is an attractive philosophy for many as all things tend toward equilibrium. The average person is likely to be very familiar with the concept of fairness gained through family, social norms or religious beliefs. In the research domain, organizational justice refers to employee perceptions of fairness in the workplace and its influence on other organizational aspects. Over the past few decades, organizational justice has become a central topic in the management sciences, having been the subject of a number of review articles (e.g., Cropanzano, Byrne, Bobocel, & Rupp, 2001; Cropanzano, Rupp, Mohler, & Schminke, 2001; Konovsky, 2000), books (e.g., Folger & Cropanzano, 1997; Sheppard, Lewicki, & Minton, 1993), and meta-analyses (e.g., Cohen-Charash & Spector, 2001; Colquitt, Conlon, Wesson, Porter, & Ng, 2001). Before going further in depth into the concept of organizational justice let us take a brief look at its origins and forerunners.

During World War II, investigators Stouffer, Suchman, DeVinney, Starr and Williams (1949) carried out research on relative deprivation with various groups of United States military personnel. Their research proposed that individuals facing objectively less favorable outcomes and working conditions (e.g., pay, promotions) did not show lower satisfaction with their work experience if they saw themselves as better off than those with whom they compare themselves. According to the theory, outcomes or benefits received weren't compared in a direct way, but were however relative to the perceiver. This meant that, one's level of satisfaction would be ascertained by if ones perceived outcomes matched or exceeded those of others despite what category these outcomes fell into. This rudimentary understanding of the human propensity to compare the self with others encouraged a host of similar studies to come.

One such similar type of study is that of psychologist Leon Festinger (1957) who proposed the theory of Cognitive Dissonance. Cognitive dissonance was described as a type of psychological discomfort that accompanies the discovery of inconsistencies within a person's ideas, beliefs or opinions. A sort of dissatisfaction with having inconsistencies within oneself and one's decision making. Accordingly, cognitive dissonance motivated an individual to reduce or remove such inconsistencies similarly to the way hunger compels someone to search for food. Research on relative deprivation, cognitive dissonance as well as other social exchange and social comparison theories made a significant influence on psychologist and researcher John Stacey Adams. In 1963, Adams proposed a theory about the antecedents and consequences of perceived equity, or the perceived fairness of outcomes (various forms of rewards and punishment) in terms of their relative distribution across persons (Rupp, Shapiro, Folger, Skarlicki, & Shao, 2017). According to Adams, inequity comes about when a person's inputs and outcomes don't match those of some other person or group that one compares himself or herself to (Adams, 1963). For example a person might perceive inequity, when he or she believes that the time and effort spent on a particular task yielded better or worse results to that of another person, group or even their former selves. This was demonstrated through laboratory studies done by Adams and Rosenbaum (1962), showing that when led to feel over-rewarded, hourly paid

workers' productivity tended to go up, whereas piece-rate workers productivity tended to go down — an effect which in each case was observed to be consistent with restoring equity.

Adam (1963) further explained that the perception of inequity does not have to be based on a logical mismatch of inputs and outputs but instead on a perceived mismatch. The intensity of inequity experienced, is also affected by its subjective nature as it depends on the level of perceived inequity as opposed to an actual mismatch of outcomes. The presence of inequity, despite its intensity, therefore motivates the perceiver to achieve equity or reduce inequity just as cognitive dissonance motivates a person to achieve consistency. Finally, perceptions of inequality are not standard across different contexts and can depend greatly on the history and culture of those involved.

During the 60's and 70's, organizational researchers devoted considerable attention to testing ideas the way workers contributed their education, intelligence, experience, training, skill, seniority and, very importantly, the efforts they expend each day at work within organizations in exchange for a salary, intrinsic reward, seniority benefits, fringe benefits, status and a range of other formal and informal perquisites among other factors (for reviews, see Campbell & Pritchard, 1976; Greenberg, 1982). The relevance of inequity research grew more and more within the organizational context as it helped to explain the exchanges made between workers and their employers or organization.

However, Adams' proposals regarding inequity were not the only attempts made to explain how inputs and outputs interacted with the expectations people had on their various relationships and situations in life. Also, of foundational importance to the study of organizational justice is Deutsch's (1975) theory of distribution principles. This theory pertains to the rules applied to allocate resources, as well as how such rules are used to assess whether allocated outcomes are fair (Rupp, Shapiro, Folger, Skarlicki, & Shao, 2017). Individuals can therefore allocate resources based on rules of equity, equality, need, entitlement or justified self-interest (Deutsch, 1975; Leventhal, 1976). Further studies have shown that different contexts (e.g., work vs. family), different organizational goals (e.g., group harmony vs. productivity), and different personal motives (e.g., self-interest motives vs. altruistic motives) have activated the use or primacy of certain allocation rules over others (Deutsch, 1975). The consideration

of allocation rules was an important extension of equity theory, which suggested that perceptions of equity were oversimplifying the overall distribution process.

It is important to note that (Adams and Deutsch) approached the study of justice from different directions. Adams' (1965) focus was on the perceiver of inequity and his/her response to it whereas Deutsch's (1975) focus was from the perspective of the allocator who 'chose' among divergent and perhaps competing ways of trying to be fair or just (Rupp, Shapiro, Folger, Skarlicki, & Shao, 2017). Another notable example is interdependence theory by (Thibaut and Kelley, 1959) which analyzed the relations between people in terms of situation structure, describing structure using variables such as dependence, covariation of interests, and information certainty (Rusbult and Van Lange, 2008). Nevertheless, all of these allocation type theories seemed to have as their goal the achievement of distributive justice (Colquitt, et al 2001).

Distributive justice was the first dimensions of organizational justice to come out of equity theory. It relates most closely to outcomes, or as the name implies, that which is distributed or given to an individual. This dimension of organizational justice was defined as an individual's perception that outcomes received are fair (Adams, 1965; Greenberg, 1990). Distributive justice is fostered where outcomes are consistent with implicit norms for allocation. the allocation of an outcome is consistent with the goals of a particular situation, such as maintaining equality, maximizing productivity or improving cooperation (Deutsch, 1975; Leventhal, 1976). The outcomes themselves can include things such as pay increases, promotions, and challenging work assignments. Findings eventually showed that the distribution of rewards was not always as important as the process by which they were allocated, i.e. the procedures and regulations set out for distributing rewards (Cohen-Charash & Spector, 2001). This realization sparked an interest in the procedures involved in distributing benefits and studies on procedural justice soon followed.

Thibaut and Walker (1975, 1978) pioneered research on the Theory of Procedure, which comprises the classical procedural justice theory. Unlike equity theory or distributive justice-oriented theorizing where the context of primary interest was one of social exchange, the context of primary

interest to Thibaut and Walker was that of dispute resolution (Rupp, Shapiro, Folger, Skarlicki, & Shao, 2017). Procedural justice, relates to the process by which outcomes are allocated to an individual. More formally it is defined as an individual's subjective perception of the fairness with which procedures are followed by the organization in determining who receives benefits (Folger & Greenberg, 1985; Greenberg, 1987; Lind & Tyler, 1988). Researchers Thibaut and Walker's (1975) proposed that procedural justice differs from distributive justice in the same way a processes that lead to a courtroom verdict were independent of the verdict itself. There is importance both in the fairness of the verdict and in the process of arriving to that verdict. Two of the main criteria for procedural justice perceptions are, process control and decision control. Process control relates to the degree of voice or 'say' an individual has in the decision-making procedure, whether or not there are rules for making decisions. Decision control related to weather an individual can influence the outcome itself (Thibaut & Walker, 1975). Procedural justice perceptions develop in an individual through comparing the processes to which one is subjected with various general procedural rules such as: consistency (e.g., the process is applied consistently across persons and time), bias suppression (e.g., decision makers are neutral), accuracy of information (e.g., procedures are not based on inaccurate information), correctability (e.g., appeal procedures exist for correcting bad outcomes), representation (e.g., all subgroups in the population affected by the decision are heard from), and ethicality (e.g., the process upholds personal standards of ethics and morality) (Leventhal, 1980; Leventhal et al., 1980). Further expansion to the above two dimensions of organizational justice later came in the form of interactional justice (Leventhal, 1980; Leventhal, Karuza, & Fry, 1980; Thibaut & Walker, 1975).

Interactional justice was defined as the interpersonal treatment individuals receive as procedures are enacted. Bies and Moag (1986) introduced this 'human side' of procedural justice by considering the quality of treatment persons received while implementing procedures that in turn determined how outcomes were distributed. This type of justice was considered to be fostered within organizations when decision makers treated individuals with respect and sensitivity and explained the rationale for decisions thoroughly. Activities such as: justification (e.g., explaining the basis for decisions), truthfulness (e.g., an authority figure being candid and not engaging in deception), respect

(e.g., being polite rather than rude), and propriety (e.g., refraining from improper remarks or prejudicial statements), were considered to foster the development of interactional justice. In some instances, interactional justice was sometimes subdivided into two sub-dimensions: interpersonal justice, which concerned the sincerity and respectfulness of communication by authority, and informational justice which was concerned with the use of open and adequate explanations for decisions (Colquitt, 2001).

With the various expansions of organizational justice research the questions of construct discrimination arose, such as: how many dimensions are there to organizational justice; how highly related are these dimensions; and can these dimensions be empirically distinguished from one another? The dimensions within organizational justice are related to several types of factors, therefore distinctions were made by looking at the way each dimension correlated with these factors as well as how well much dimensions related with each other. The relationship between each dimension of organizational justice and the factors related to them thus differed significantly enough to warrant a distinction between constructs (Cohen-Charash & Spector, 2001). One example can be see with research done by Folger and Konovsky (1989). They surveyed the perceptions of distributive and procedural justice, pay satisfaction, supervisory trust, and organizational commitment of first-line manufacturers. Results showed distributive justice to be a stronger predictor of pay satisfaction, whereas procedural justice was more relevant for predicting general job attitudes such as trust and commitment. Thus, some distinction could have been made between the dimensionality of distributive and procedural justice. Still, there has been debate as to the number of the dimensions within organizational justice, with various groups of researchers asserting between one and four different dimensions (Cohen-Charash & Spector, 2001; Colquitt 2001; Zainalipour, 2010).

Colquitt et al (2001) conducted a meta-analytic review, consisting of 120 separate meta-analyses of 183 empirical studies which found high correlations among the justice conceptualizations, but not so high that they seem to be multiple indicators of one underlying construct (Colquitt et al, 2001). The study supports a four-factor model. On the contrary to this four factor model, fairly recent research by Holtz and Harold (2009) has indicated that overall justice, i.e. one single dimension, can predict overall job satisfaction and influence other organizational phenomena better than specific justice

dimensions. The argument made is that persons within an organization often consider fairness issues in a holistic manner, disparaging the need to differentiate between the various dimensions of organizational justice.

Aside from the extremes which show organizational justice as having either four dimensions or one dimension, there has been a proposed two dimensional model as well as the most popular three dimensional model. The two dimensional model is based on the idea that interactional justice is actually an extension of procedural justice that pertains to the human side of procedures. Interactional justice and procedural justice were therefore combined because of their high inter-correlations and similar consequences (Cronpanzano, 1997). There has, however, been significant research to reject the idea of a two-factor model (Cohen-Charash & Spector, 2001; Colquitt, 2001). Further investigation supported the idea that employees evidently make a distinction between fairness of organizations and supervisors (Rupp, Cropanzano, 2002; Erdogan, 2002).

The three factor model consists of distributive, procedural, interactional justice dimensions. In this model, Interactional justice seen as its own dimension as compared with the four factor model where is replaced by the two dimensions: interpersonal and interactional justice (Colquitt et al. 2001). The three factor model is the most commonly used theoretically and methodologically throughout organizational justice literature (Kovačević, Zunić & Mihailović, 2013). The popularity of both the three factor and four factor models inspired a suggestion by Lind and Tyler (1988) to apply both models to research questions in an attempt to advance the field of organizational justice in general.

Factors affecting organizational justice

At the level of the individual, organizational justice perceptions can be affected by a range of variables. In summary, these variables can be placed into three major categories (i) the outcomes one receives from the organization; (ii) organizational practices such as procedures and quality of interactions; and (iii) the characteristics of the perceiver. The effect each variable has on justice perceptions can vary and may also depend on or be interconnected with other variables; a common

occurrence among psychological constructs. Some of the more prominent variables that fall into the category of outcomes one receives from the organization lies variables such as: salary, organizational support, outcome feasibility and outcome satisfaction. The category of organizational practices can include variables such as: voice, communication with employees and leader-member exchange. Examples of characteristics of the perceiver include: age, gender, cultural background, education type and level, organizational tenure (time spent within the organization), performance, level of personal compliance with decisions, as well as personality characteristics such as negative affectivity and self-esteem (Wanberg et al. 1999; Cohen-Charash & Spector, 2001; Colquitt, Conlon, Wesson, Porter, & Ng, 2001).

The effects or outcomes of justice in organizations were found to be far reaching, affecting the way persons feel and how they interact with each other (Lind & Tyler, 1988). Greenberg (1990; 1987) put it simply; if people believed that they were being treated fairly, they were then more likely to have positive attitudes about their work and their work outcomes and were more satisfied with the decisions resulting from group procedures. Outcomes associated with organizational justice (procedural, distributive or interactional) include: work performance, organizational citizenship behaviour, counterproductive work behaviour, job satisfaction (various types), organizational commitment, employee turnover intentions and trust (in management and in the organization). Work performance is strongly related to procedural justice, but hardly to distributive and interactional justice (Konovsky & Cropanzano, 1991). Procedural, distributive and interactional justice types are all related to organizational citizenship behaviours (Colquitt et al, 2001). On the other hand, counterproductive work behaviours are also related to both procedural and to distributive justice types. Findings also show that there exist similar relations among all justice types and job satisfaction (including supervisor satisfaction, union satisfaction and intrinsic satisfaction). Only pay satisfaction is different as it more highly correlated to distributive justice than the types of satisfaction – an effect that is predicated by social exchange theory (Colquitt et al, 2001). Organizational commitment is related to all three types of organizational justice. In more specific terms, affective commitment (emotional attachment to the organization) is related to all three types of justice whilst continuance commitment (attachment to the

organization that is based on an inability to quit rather than on positive endorsement of the organization) has been found to be negatively related to procedural and interactional justice (Tepper, 2000). Employee turnover intentions are related to organizational justice in various ways (Daly & Geyer, 1994; Konovsky & Cropanzano, 1991). Specifically, procedural and distributive justice types both have been found to equally predict turnover intentions whilst interactional justice least predicted intentions (Colquitt et al, 2001). Procedural, distributive, and interactional justice types were all found to predict trust in organization/management. Further, leader-member exchange (LMX) quality is also related to all three justice types though it is most highly related to interactional justice as this form of justice deals primarily with the relationship between persons in the organization (Colquitt et al, 2011; Folger & Konovsky, 1989; Konovsky & Cropanzano, 1991; Konovsky & Pugh, 1994).

Challenges and concerns with organizational justice research

The body of research pertaining to organizational justice, despite its numerous contributions to general organizational research, has some setbacks or inconsistencies which must be considered. First among these is the persistence of the debate on the dimensionality of organizational justice and its sub components, as research still produced mixed results as to how exactly they should be conceptualized (Cohen-Charash & Spector, 2001). The most popular conceptualization is that of the three dimensional model (Kovačević, Zunić & Mihailović, 2013; Rupp et al., 2017), however the case for a four dimensional model, made by Greenberg (1987) and restated by Colquitt's meta-analytic review (Colquitt, 2001; Colquitt, Conlon, Wesson, Porter & Ng, 2013), has yet to be comprehensively refuted.

Another fundamental concern, related to the first, has to do with the measurement of each dimension. Though there are measures that are preferred for their potential accuracy, the body of research sometimes references studies within which the measures used have not been consistent with the proposed dimension. For example, in the case of general organizational justice perceptions, some measures that included granting subordinates voice, treating subordinates consistently, suppressing biases, being respectful, and providing explanations, have been labelled as within the interactional

justice dimension for some studies (e.g., Moorman, 1991; Skarlicki & Latham, 1997) yet also labelled as "managerial responsibilities" under the procedural justice dimension in other studies (Folger and Bies, 1989). As new dimensions were proposed, there was less research that attempted to develop the various constructs within themselves but instead a great push to define the proper number of justice perceptions (Rupp et al., 2017).

A review of literature by Rupp et al., has brought into question the way organizational justice is considered as a construct. Despite the fact that organizational justice is presented as having three or four dimensions, the fact remains that these dimensions emerged separately and at different times, and that their interrelation or correlation does not exactly make them all a part of the same construct. The review argues that the consensus around either the three dimensional or four dimensional model of general organizational justice is not based upon research that sought to uncover the full range of justice perceptions available but instead is an integration of different theories and observations that have been carefully woven together over time (Rupp et al., 2017). Furthermore, the various theories from which each dimension of organizational justice originated (social exchange, relative deprivation, interdependence, etc.) each have their own critiques which can potentially apply to organizational justice research. For instance, the social comparison process is considered as foundational to both equity theory and the theories that have grown out of equity theory (fairness theory, Folger & Cropanzano, 1988, 2001), yet it has not been considered in current research related to distributive justice (Rupp et al., 2017).

Many organizational justice theories were founded and developed in a time where organizations differed greatly from the organizations of today. There are two major differences to be considered, the first is that of technology and the second is structure. In the modern organization, technology allows for the shrinking of distance and the expansion of work tasks; it allows people to work well over great distances and without interacting with each other face to face. This modern arrangement with its new complexities can have implications for how justice is perceived. Interactional justice is highly related to how people interact; i.e. the way information is shared between persons. In this new age, persons may expect their organizations or managers to communicate more or with the various new means of

communications the organization and its representatives may be held to higher standards. Also, there are organizational structures that provide for a worker having one manager present and another manager, relating to another project, operating virtually (via email etc.) Similarly, procedural justice is affected by the way procedures are enacted within the modern organizational context as organizational size and structure can have an effect on the concept of voice and how an employee feels about voicing his concerns with procedures enacted. For example, in a context where some team members are physically present and others are virtually connected, there may be significant differences between persons that are present and those that are far away in perceived voice or the effectiveness of voicing one's concerns. This reality must therefore inform research so that such nuances can be considered. Distributive justice is also likely to become a more complicated concept to measure within modern organization. New age methods of contracting employees, for example, can have a effect on how distributive justice is perceived. The typical case where workers doing similar jobs have been hired under different types of contracts with different benefits can be reflected in justice perceptions. In another instance, modern organizational structure can include workers hired by an employment agency to work within another organization; this type of arrangement can create multiple organizational identities within employees (Scott, Corman, & Cheney, 1998) and by extension nuance within justice perception (Rupp et al., 2017).

Unlimited access to information via the internet raises the important research questions about which sources of information will have the greatest influence on justice perceptions. Perhaps an employee may have one level of justice perception related to his organization but another of the organization as a whole, when compared to other similar organization and how they operate. Thus, "my treatment is fair within my organization, but my organization in general isn't a very fair one in the larger scheme of things." The way each employee treats with such information is likely to differ with each individual placing more weight on one perspective over another.

The differences between distribution of resources, procedures and interactions can vary significantly as organizational structures have become a more complexed web of teams and projects with differing targets and budgets to work with in a simultaneous fashion. Hence organizational justice

research could stand to benefit from some reinforcement of the concept within itself and efforts to achieve parsimony just as it has benefitted from expanding its focus via the multifoci approach.

Peer Justice Climate

Organizations have evolved in many ways to meet the demands of a world that has been changed by globalization and new technology. One popular and fairly recent development among organizations is that of employee work teams and the dependence on teamwork to carry out objectives. Employee work teams have developed over the last forty years into being one of the preferred method of structuring work within most organizations (Stevens & Campion, 1994). In a similar way, organizational research also advanced to appreciate advances within the organization. Since teamwork became more of a mainstay or typical means of carrying out work tasks, organization justice research flowed naturally from observing constructs at the individual level to considering justice at the team level (Li & Cropanzano, 2009).

According to multifoci justice literature, there are various sources within the social environment capable of acting fairly or unfairly (Li, Cropanzano & Bagger, 2013). The level of fairness exhibited by these sources can vary such that an individual may be treated fairly by one source and unfairly by another. Individuals are, therefore, likely to develop different justice perceptions for each of these sources and are capable of distinguishing these perceptions (Liao & Rupp, 2005). This multifoci justice literature, made a framework within which research could go beyond the established sources of justice perceptions to considering the likelihood of team members or coworkers as being a source. Research to support investigating within unit relations came from De Cremer (2002) who found that respectful treatment by ones teammates was related to individuals' perceptions of inclusiveness and contribution toward the team. Also, Simon and Sturmer (2003) found that when group members treated each other with respect a collective identification with the group developed which motivated well treated team members to make greater considerations for the team. Similarly, Lavelle and colleagues (2007) demonstrated through research that work group commitment mediated the relationship between the group's procedural fairness perceptions and the citizenship behaviors expressed toward each other.

These various sources of evidence called attention to the need for considering team members as a potentially important and influential source of justice perceptions.

As persons within a group share outcomes that are based upon their collective efforts, individuals can hold their peers accountable for these outcomes (Bishop & Scott, 2000). Thus, peer justice or intraunit justice research was aimed at investigating coworkers as a source of fairness for each other (Cropanzano, Li and Benson, 2011). Li and others (2011) notably defined the construct *peer justice climate* as; the collective perception that individuals within a unit judge the extent to which they treat one another fairly – without having any formal authority over each other. The need for this extension of research within the domain of organizational justice became apparent as the use of work teams has become a mainstay in contemporary organizational structure meaning that team members are likely to become a more permanent source of justice perceptions and its effects.

Investigations into peers justice climate, naturally came up against questions of validity. There were inconsistencies in research findings which created some and doubt as to the distinction made between the concept of peer justice climate and a similar construct known as *justice climate* which measures the degree of fairness perceived by a team of persons as a unit toward external elements such as supervisors or the organization. A primary concern was: could these separate constructs be measuring the same thing? Another legitimate concern considered the potential of workers to confuse various interwoven aspects of organizational contexts. Could an individual consistently distinguish the difference between perceptions linked to a person and the organization that the person represents? These issues were investigated by Li and others (2013), who were able to validate the hierarchical structure of justice climate and peer justice using data collected from undergraduate students. These same investigations were later replicated by Molina, Moliner, Martínez-Tur, Cropanzano and Peiró (2016), who provided evidence to support that both justice climate and peer justice climate display a higher correlation within their sub dimensions than between them. Thus validating them as separate constructs.

Despite, the validity of peer justice climate as a distinct construct, there were still concerns about its internal structure. In their theoretical model, Cropanzano and Benson (2007) argued that peer

justice climate, similar to its individual level counterpart, should include three parallel dimensions. However various researchers have proposed differing models claiming otherwise. For researchers Ambrose and Schimke (2007) all peer justice perceptions would be within the realm of interactional justice as these perceptions are linked to the interpersonal treatment and communication between persons. They stated, "allocation decisions and the procedures used to make those decisions are not the role of coworkers" (p. 404). Thus distributional and procedural justice perceptions were incompatible constructs. A reasonable argument.

Cropanzano and colleagues only included procedural and interactional justice in their 2011 study (Cropanzano, Li, et al., 2011), opting to leave out distributive justice from their analysis. This left some ambiguity with regard to the dimensionality of peer justice climate. Allowing for further research to be done by Li, Cropanzano and Bagger, who in the year 2013 sought to investigate the structure of peer justice climate and concluded that the three-dimensional model (distributive, procedural, interactional) fit their data albeit marginally. They proposed therefore that peer justice climate should be considered as a composite variable with the specific fairness dimensions serving as first-order indicators of a second-order overall justice factor (p. 581). This overall justice factor was labeled overall peer justice climate.

In distinguishing the differences between the dimensions of peer justice climate, distributive peer justice climate perceptions were based on the reward that team members received based on their contributions. The reward must be seen as appropriate considering the effort the person has placed in arriving at the team's goals. Procedural peer justice climate perceptions were based on the fairness of decisions made by team members as well as the consistency of fair decisions. Team members must be allowed to voice their dissent and manage the decision-making process in a consistent and accurate fashion in keeping with the rules prescribed by Leventhal (1976). Interactional peer justice climate perceptions were based on the manner in which team members treated each other. Team members are expected to treat each other in a respectful manner and refrain from inappropriate interactions.

Peer justice climate has proven to be valuable in advancing the understanding of overall organizational justice For example, Li and Cropanzano (2008) proposed that peer justice climate boosts the quality of interaction among team members; this enhanced quality, goes on to engender favourable attitudes and organizational citizenship behaviours (OCB). The results demonstrated that peer justice climate was related to teamwork quality, satisfaction with teammates and unit-level citizenship behaviours. Teamwork quality was found also to mediate the relationships between both distributive and procedural peer justice climate and satisfaction and OCB. Further to these effects, Cropanzano, Li and Benson (2011), later noted that interactional and procedural peer justice climate each explained variance in team processes beyond the effects found at the individual level. This established conceptual value for peer justice climate and its inclusion or consideration in future organizational research, especially multifocal research.

Measure of peer justice climate

At this time only one published measure for peer justice climate was discovered within the organizational justice literature (see Appendix 1). The measure, constructed by Li (2008), utilizes primarily items from other measures that were deemed to be adequate — with some modifications — at capturing the desired construct based on its theoretical origins. It is important to point out here that Li's approach must also be considered in the context of the multifocal justice literature on an individual's ability to distinguish between sources of justice perceptions. For example, one's workplace may promote fair treatment with clearly outlined rules, however, the person administering these rules may do so in a biased and inconsistent manner. In such a situation, distributive organizational justice perceptions can be high (due to the clear rules) meanwhile procedural and interactional organizational justice perceptions may be understandably low (due to the procedures and persons). Individuals are likely to develop different justice perceptions for each of these sources and are capable of distinguishing these perceptions (Liao & Rupp, 2005). Li (2008) therefore relies on the supposition that individuals can also determine that justice perceptions are originating from their peers, differentiating these perceptions from traditional organizational justice perceptions. This author uses this understanding of

justice as a guide to finding measures that are able to capture perceptions related to either team level distribution, team level procedure or team level interaction and modified them to serve the required purpose of measuring peer justice climate perceptions.

According to the version of the measure used in Li's thesis (2008) the items for the peer justice climate measure were carefully constructed by considering the theoretical basis for each dimension of peer justice climate. The rationale used for the measure was as follows: organizational distributive justice perceptions were based on a tendency of individuals to allocate resources based on rules of equity, equality, need, entitlement or justified self-interest (Deutsch, 1975; Leventhal, 1976). Thus, to detect peer justice climate perceptions, Li adapted a measure of how team members contribute equitably to their team's effort (George, 1992). Next, organizational procedural justice perceptions were based, in theory, on how persons assess the processes they are subjected to using general rules of consistency (e.g., the process is applied consistently across persons and time); bias suppression (e.g., decision makers are neutral); accuracy of information (e.g., procedures are not based on inaccurate information); correctability (e.g., appeal procedures exist for correcting bad outcomes); representation (e.g., all subgroups in the population affected by the decision are heard from); and ethicality (e.g., the process upholds personal standards of ethics and morality) (Leventhal, 1980; Leventhal et al., 1980). By revisiting these criteria, Li developed five items to evaluate the peer justice climate procedures used in teams. Third, Bies and Moag (1986) introduced organizational interactional justice as the human side of procedural justice, which considered the quality of treatment persons received while implementing procedures that, in turn, determined how outcomes were distributed. Li therefore based his items for measuring interactional peer justice climate perception on a four-item scale developed by Donovan, Drasgow and Munson (1998) for determining the likelihood of teammates treating each other with respect and helping each other perform tasks.

Leadership

Leadership is an important factor influencing team processes and outcomes. Extensive research on leadership has been carried out within organizations and groups, especially with respect to its effect on team effectiveness and its contribution to team/organizational outcomes (Horner, 1997). Leadership research may be considered as one of the more diverse areas of organization with studies developing from a range of contexts and also having varied theoretical standpoints or interests. Further to this, various of levels of research – such as: intra-individual, dyadic, group, and organizational – have opened many new ways of understanding how leaders and leadership works in the context of the organization. This chapter is offered as a brief prologue on leadership theory over the years leading up to research on shared leadership.

Major historical leadership trends

The earliest studies in contemporary leadership dealt with the attributes of the great leader. Persons were considered to be born leaders and thus leadership qualities had to be identified so these persons could be placed in leadership positions (Bernard, 1926). Therefore researchers observed personality, physical, and mental characteristics of leaders so as to try to make a link between particular traits and leadership. Eventually this theoretical approach revealed a major shortcoming – it did not consider closely enough the role of situational and environmental factors on leader effectiveness (Horner, 1997). If it were at all possible to identify the perfect combination of personal characteristics of a leader, these characteristics may be ill suited to some situations or environments.

The subsequent major trend in leadership studies observed the behaviours of successful leaders in the context of the organization (Halpin and Winer, 1957; Hemphill and Coons, 1957). The Michigan and Ohio State leadership studies were key in this regard as they chose to focus primarily on the observable behaviours of leaders instead of their traits or qualities. These studies aimed at identifying leadership behaviours or styles that resulted in higher group performance. Thus, unlike in born traits

which could only be identified and not modified, observable behaviours could be taught and leadership skills developed(Saal and Knight, 1988).

Leadership research later went on to consider the effects of a leader's actions in a particular context. This type of research led to the development of contingency theories which made the assumption that the effects of one variable on leadership are contingent on other variables (Saal and Knight, 1988). Contingency theories of leadership were particularly important as they introduced the idea of leadership being specific to each context. Contingency theories also opened the door to the emergence of the leader-member exchange theory which delved into the relationship between leaders and followers and how the relationship between them impacts the leadership process (Graen, 1976).

These older theories of leadership, also known as traditional theories, were only able to account for a relatively small percentages of variance in performance outcomes, leading researchers to seek out alternative approaches to leadership. What followed are now considered to be 'new models' of leadership, which focused on: symbolic leader behaviour; visionary, inspirational messages; emotional feelings; ideological and moral values; individualized attention; and intellectual stimulation. Since the development of these new models of leadership, there have been offshoots in leadership research in the form of charismatic and transformational leadership theories. Charismatic and transformational leadership theories are currently among the most frequently researched leadership theories (Avolio 2005, Lowe & Gardner 2000).

Modern leadership theory

The scope of modern leadership theory has expanded immensely since the earliest research. Now, leadership research involves not only leaders but can include research on the attitudes and behaviours of: followers and colleagues as well as the characteristics of the work environment and culture. Another noteworthy development is that leadership research has grown past the tendency to build up theories based on the American businessman as the typical leader, instead, leadership research now includes more diverse individuals and types of organizations (Avolio, Walumbwa & Weber, 2009).

The Global Leadership & Organizational Behaviour Effectiveness (GLOBE) initiative, originally conceptualized by Professor Robert J. House is one of the most noteworthy examples of large scale leadership studies that explores the similarities and differences of leadership across cultures.

Though the majority of research discussed thus far has pertained to a single individual as leader, research has also considered intra-individual, dyadic, group, and organizational leadership. These various levels of leadership research provide significant insight, however, there is the need for more integration across the individual and group level of leadership research (Yukl & Yukl, 2002).

The reality of leadership in organizations and teams is that it is in most cases distributed across a number of individuals in formal and informal ways. As it pertains specifically to teams, one perspective, suggests that it is possible for all team members to participate in the leadership process (Avolio et al., 2009). Therefore when two or more persons share in the roles, responsibilities, and functions of a leader, shared leadership or distributed leadership occurs.

Shared Leadership

Research proposing that leadership can be distributed across a number of individuals, rather than being focused in a single leader has been around for at least sixty-five years (Gibb, 1954; also see Bowers & Seashore, 1966). Since these early ideas, shared leadership has being conceptualized in a number of different ways with consensus consolidated around two ideas: first, that leadership is not just a top-down process between the formal leader and team members; and second that there can be multiple leaders within a group (Day et al., 2004: 873–875). Theoretical and empirical work exploring the antecedents and consequences of distributed leadership is at an early stage (Yammarino et al., 2012) however, scholars have suggested that the shared leadership approach potentially provides a more suitable solution to team management than more orthodox approaches (Day et al., 2006; Gronn, 2000, 2002; Hoch, 2007). Further, the impact of shared leadership was found to exceed the impact of other forms of leadership in predicting team and organizational outcomes (Ensley et al., 2006; Pearce & Sims, 2002).

The concept of shared leadership, though less frequently discussed among the numerous theories of leadership, is not a new. Early research by Gibb (1954) suggested that leadership could be focused or shared. Focused leadership occurred when the roles, responsibilities, and functions of leadership resided with one person whereas shared leadership occurred when these factors resided with several. Thus, focused and shared leadership were on different ends of a spectrum within which a group's actual leadership arrangement can exist (Gronn, 2002). Another early explanation of shared leadership comes from Yukl (1989) who explains that it originated when various team members influence the team through activities such as direction, motivation, and support. The series of interactions among team members that share in leadership activities, results in a 'leadership network' that shapes both team and individual activities and outcomes.

In recent research, shared leadership is conceptualized as a team level outcome that occurs when two or more individuals share the roles, responsibilities, and functions typically expected of a

leader (Day et al. 2004). One critique of modern research is the lack of agreement on its definition (Carson et al. 2007), however, there seems to be a high degree of consensus around the following definition. Shared leadership is ‘‘an emergent team property that results from the distribution of leadership influence across multiple team members. It represents a condition of mutual influence embedded in the interactions among team members that can significantly improve team and organizational performance’’ (Carson et al., 2007, p. 1,218). This definition goes beyond explaining shared leadership as being among several members of a team, to emphasizing that it is emergent. The emergent nature of shared leadership highlights that it comes through the interaction of various team members (O’Connor & Quinn, 2004).

Antecedents and outcomes of shared leadership

The presence of shared leadership has been interpreted as a phenomena that emerges out of a need to fill a gap in leadership (Hoch, Pearce & Welzel 2010), however, it may be more likely that various leaders emerge from a team if the conditions are feasible. Several studies have illustrated that various factors must be present to ensure that shared leadership can develop among team members. The development of shared leadership depends on a team environment that provides social support for its members; a shared purpose for achieving the teams goals; and the ability to voice their concerns in an open way (Carson et al., 2007). This team environment is only the first step as the team members themselves must also: be willing to offer leadership and seek to influence the direction, motivation, and support of the group; and, be willing to rely on leadership by various team members (Carson, Tesluk & Marrone, 2007; p1222). Research by Wassenaar and Pearce (2012, p. 367) also emphasizes that empowerment is a critical and necessary component for the development of shared leadership”

In their review Bennett, Wise, Woods and Harvey (2003) explain that shared leadership is the result of conjoint activity. Conjoint activity is characterized by several persons interacting and depending on each other to carry out team related tasks, similar to task interdependence. Interdependence is also a common predictor of various social processes (e.g. Deutsch, 1949; Tjosvold,

1998) and has consistently been highlighted as a necessary for the development of shared leadership. Team members are more likely to share in leadership when they face situations with high levels of interdependence (Pearce, 2004; Fausing, Joensson, Lewandowski & Bligh, 2015). Team interdependence can depend on the type of team, or on the extent to which team members behave in an interdependent way. Teams that require the input of all members for producing an output are considered as having a high level of team interdependence meanwhile teams where members do not rely on each other for outputs are considered as having low interdependence. This being said, teams that may require high levels of interdependence are not guaranteed to develop shared leadership as team members may be limited in their expression of interdependent behaviour.

The outcomes of shared leadership has been found to have an effect on various team outcomes across a range of distinct situations and circumstances. Team effectiveness was correlated with shared leadership by Avolio and colleagues (1996) in undergraduate students, whilst Pearce and Sims (2002) made a similar correlation among workers in an automotive manufacturing firm. Team performance and potency over time were also found to be correlated with shared leadership among undergraduate business students (Sivasubramaniam et al., 2002). When compared with the more traditional vertical leadership, shared leadership was found to be stronger predictor of performance work teams (Hoch et al., 2010b; Ishikawa, 2012), virtual teams (Pearce, Yoo, & Alavi, 2004) and management teams (Ensley, Hmielski & Pearce, 2006)

Mehra, Smith, Dixon & Robertson (2006) provide some theoretical rationale for the effect of shared leadership on performance. According to these authors more team member participation in the leadership role enhances overall group participation and information sharing. Therefore, in the context of a conducive team environment, task interdependence and a willing team membership, each person is allowed to express their own leadership qualities or behaviours (e.g. communication and task coordination), allowing for any positive effects of leadership on performance to be magnified.

Carson, Tesluk and Marrone, 2007 found that even when a single member of a team, does not exhibit leadership behaviour team performance can be affected. On the contrary, empowering

leadership (Martin et al., 2013) and high levels of leadership influence among team members (Taggar et al., 1999) have been found to simulate leadership behaviours and drive the benefits that shared leadership has on performance. These results dovetail well with the idea that it is the collaborative effect of individual leadership behaviours that underpin the relation between shared leadership and performance.

The relation between shared leadership and team effectiveness can be difficult to determine. Since shared leadership comes out of a team interactions, its relation with a team's overall effectiveness must be determined through observing the quality and usefulness of team interactions as opposed to any individual leadership effort. Further, Kozlowski and colleagues (2006) emphasize the importance of measuring team perception of leadership effectiveness rather than deduce this effectiveness through the use of other variables such as team performance and team effectiveness.

Measurement of shared leadership

Two established methods of measuring shared leadership include the use of the Shared and Vertical Leadership Questionnaire (Pearce & Sims, 2002) and the use of a social network analysis (Mayo, Meindl, & Pastor, 2003). The shared and vertical leadership questionnaire includes various leadership sub measures for assessing the level of shared leadership expressed by team members and also categorizes vertical or 'traditional leadership' of a supervisor in terms of transformational, transactional, directive, empowering, and aversive leadership behaviours. The social network analysis also provides a method for modelling both vertical and horizontal leadership relations within a team, however it does not categorise leadership behaviours. This method also provides the added benefit of determining the density of shared leadership within a team (Sparrowe et al., 2001) as well as allowing for the creation of sociograms to observe patterns of relations (Carson et al., 2007).

Internal Team Environment

Internal Team Environment is a higher order construct that consists of three highly interrelated and mutually reinforcing dimensions: shared purpose, social support, and voice (Carson et al., 2007). The development of shared leadership has been shown to be facilitated by a conducive team environment (e.g., Avolio et al., 1996; Pearce & Conger, 2003; Seers, 1996; Yukl, 1989). As one of the most consistent antecedents of shared leadership, it is important to measure team environment in teams as a way to determine if shared leadership is likely to develop.

Shared purpose refers to a set of agreed upon goals that unite team members causing them to feel motivated empowered and committed to their team (Kirkman & Rosen, 1999). Carlson and colleagues (2007) describe shared purpose as, "when team members have similar understandings of their team's primary objectives and take steps to ensure a focus on collective goals." When motivation and commitment is shared by various team members, a willingness to share in leadership responsibilities also follows.

Social support is necessary to create an environment where team members feel supported by each other. Feelings of support come through encouragement and recognition of accomplishment and contributions (Marks et al., 2001). The result of social support is emotional and psychological strength which further reinforces team members to participate actively and shared responsibility for team outcomes (Kirkman & Rosen, 1999).

There are several ways to describe voice, as the construct has been associated with various types of team interactions. With respect to team environment, voice is understood to be the degree to which a team's members have input into how the team carries out its purpose (Carson et al, 2007). Within organizational justice, similarly, voice is considered to be extent to which team members feel allowed to express their concerns. In both cases voice has to do with the ability to participate in the team, whether it is to encourage or to express dissent. Voice is demonstrated through team member participation in decision making, constructive discussion and debate around alternative approaches to a team's goals, tasks, and procedures (De Dreu & West, 2001; Simons, Pelled, & Smith, 1999). Team

commitment, involvement and collective influence are all results of the presence of voice within the internal team environment (Carson et al. 2007).

Team environment is an important antecedent for this study as it helps to describe some of the antecedent behaviours to the development of shared leadership. Shared leadership is characterized by various interactions among team members as they get involved in the leadership process. This study is particularly interested in understanding the types of behaviours involved in shared leadership and also in developing an internal team environment that encourages shared leadership. These behaviours are likely to be similar or even the same as those described by several teamwork competencies, opening the door for using teamwork competencies to explain, not only team performance, but also other important team related outputs like shared leadership. Carson et al., (2007) encouraged researchers to observe levels of task competence in terms of how teams function when shared leadership exists.

Operational Definitions

Teamwork Competencies

Competencies are defined as the underlying characteristics integrated with an individual's knowledge, skills, and abilities that are causally related to a referential criterion of effective and/or superior action in a specific job or situation (Spencer & Spencer, 1993). Stevens and Campion (1994, 1999) identified five transportable teamwork competencies: (1) conflict resolution, (2) collaborative problem solving, (3) communication, (4) goal setting and performance management, and (5) planning and task coordination. Teamwork Competencies are an inherently individual quality, and as such will be measured at the level of the individual. The Teamwork Competency Differential will be calculated for analyses at the group level.

Teamwork Competency Differential

Unique individuals possess unique knowledge, skills and abilities, thus it is likely that for any given team, there will be a difference in the levels of teamwork competencies for each team member. The teamwork competency differential is the variance in the levels of teamwork competencies self-reported by each of the members of a team. The differential is calculated on a team basis. First, the level of teamwork competencies of each individual is assessed using the TWCT. Next, the mean level of teamwork competencies for each team is calculated. The teamwork competency differential for each individual is calculated as the real or positive difference between his or her teamwork competency score and the mean score of the team he or she is in. The teamwork competency differential for a team is calculated as the standard deviation of its teamwork competency scores. Teamwork competency differentials were calculated for, overall levels of teamwork competency, the two major categories of teamwork competencies, and each of the five individual teamwork competencies (see. Table 1 for a list

of teamwork competencies). The teamwork competency differential was used for analyses at the team level.

Shared Leadership

An emergent team property that results from the distribution of leadership influence across multiple team members. It represents a condition of mutual influence embedded in the interactions among team members that can significantly improve team and organizational performance'' and is determined by the perception of those within the team (Carson et al., 2007, p. 1,218). This operationalization is consistent with the classic sociometric work on leadership in teams (e.g., Stogdill, 1948; Shaw, 1964), and it is also consistent with other popular theoretical conception of leadership as a phenomenological construct; i.e. a leader is someone who is perceived as such by others (Calder, 1977; Meindl, 1993; Pfeffer, 1977). Shared leadership will be measured at the team level, by calculating the density of Shared Leadership with respect to the number of members in the team (Sparrowe, Liden, Wayne & Kraimer, 2001; Carson et al., 2007). As more persons perceive shared leadership a team's density score increases.

Individual Leadership Perceptions

The measure used to collect data for Shared Leadership will be also used to determine the level of leadership behaviours perceived at the individual level. The sum of all leadership scores given by each participant, is an indicator of the amount of leadership perceived. This is because, using the social network approach, leadership scores are assigned to each member of a team. Thus, if shared leadership develops, more team members are likely to exhibit leadership qualities causing each team member to earn a higher score from colleagues. As team sizes differ, the mean value of leadership perceived is preferred, so as to allow for comparisons to be made between groups. Higher scores on leadership behaviours perceived will translate to a higher average in leadership behaviours perceived by each

individual. The score of individual leadership perceptions would therefore be a reflection of the average level of leadership perceived in other group members on a scale of 1 to 5.

Internal Team Environment

Internal team environment is made up of three mutually reinforcing and complimentary dimensions: shared purpose, social support, and voice. Shared purpose refers to levels of motivation, empowerment, and commitment that individuals experience which increase their willingness to share the team's leadership responsibilities (Avolio et al., 1996). Social support is defined as the efforts that team members makes to provide emotional and psychological strength to one another. Voice, is defined as the degree to which a team's members have input into how the team carries out its purpose. These three dimensions are known for facilitating shared leadership.

Peer Justice Climate

The collective perception that individuals within a unit judge the extent to which they treat one another fairly – without having any formal authority over each other. Peer justice climate perceptions are expressed in terms of three underlying sub-dimensions: distributive peer justice climate, procedural peer justice climate and interactional peer justice climate (Li, 2008; Li *et al.*, 2013).

Individual Perceptions of Peer Justice

As each person will fill out a questionnaire on their perception of peer justice climate, theses scores will be used for analyses at the individual level. The scores will be aggregated for analyses at the group level.

Performance

Performance is measured at an the individual and group levels. At the individual level performance refers to the output made by an individual as a result of activities his or her own activities to complete the outlined course objectives. The evaluation of performance is given by the course professor and is a reflection of a student's knowledge and written communication skills. Team performance refers to the output made by the team as a result of their collaborative activities. Team performance is awarded based on each team's skill in planning and task coordination as well as their ability to communicate verbally via a presentation.

- Chapter 3 -

Preliminary Study

Hypotheses

Hypotheses – Preliminary Study

The objective of this study is to explore the suitability of the peer justice climate questionnaire (PJCQ) and teamwork competency measure (TWCT) to be used in a multicultural context, it also aims to provide some verification for the structure of the constructs measured as this will not be possible with the main study.

Peer justice climate research, as a relatively new offshoot of organizational justice research, requires support to determine its potential for explaining team dynamics. The PJCQ provided by Li (2008) was expected to produce data that reflected a three-dimensional structure for peer justice climate (distributive, procedural and interactional). In addition to the premise that peer justice climate is made up of three dimensions, there has also been evidence to support that these three dimensions form part of an overall peer justice climate factor (Li, 2008; Li *et al.*, 2013). Thus the following two hypotheses are proposed:

H1 – Peer justice climate perceptions are composed of three dimensions. These represent distributive, procedural, and interactional peer justice climate.

H2 – Distributive peer justice climate, procedural peer justice climate and interactional peer justice climate will serve as indicators of an overall peer justice climate factor.

Next, the TWCT, is a recently developed questionnaire by Aguado et al. (2014) that attempts to revise and perhaps replace the TWKSAT – a questionnaire created by Stevens and Campion (1999) for the same purpose of measuring teamwork competencies. The developers propose that the TWCT should be able to identify five distinct teamwork competencies which can be divided into two categories: interpersonal teamwork competencies and self-management teamwork competencies. The interpersonal teamwork competencies include: 1) conflict resolution; 2) collaborative problem solving; 3) communication. The self-management competencies include: 4) goal setting and performance

management and 5) planning and task coordination. These competencies are made up of 14 individual KSAs, which can produce anywhere between 8 and 14 factors in an exploratory factor analysis depending on the features of the sample and also due to the likelihood of overlap between KSAs. Despite the potential for producing a variety of factors, the factors produced by this measure are expected to fit tidily into the five competencies which they make up. The following hypotheses are therefore proposed:

H3 – The Teamwork Competency Test (TWCT) will be able to identify five distinct teamwork competencies. These competencies are: conflict resolution; collaborative problem solving; communication; goal setting and performance management; and planning and task coordination.

H4 – The five distinct teamwork competencies will form a part of two second order factors representing the categories, interpersonal and self-management competencies.

Methods

Participants

Data for the preliminary study were collected from 304 undergraduate students (*N*=304) of three large universities in Trinidad and Tobago. All participants were full time students who were at least in their second year of university studies. Students were allowed to participate only if they had already undergone a group project for a shared grade while studying at their respective universities. Participation was voluntary and participants were recruited via convenience sampling during the same week around the middle of the semester. Participant ages across all university samples ranged from 17 to 30 years old (*M* = 21.16, *SD* = 2.39). Care was taken to ensure that the sample selected was gender balanced, therefore, fifty-four per cent of the students were female. The racial distribution of participants was also selected so as to be intentionally similar to the population of the Republic of Trinidad and Tobago (Trinidad and Tobago Population Census, 2011). Therefore, there were 34% Africans, 33% East Indians, and 31% Mixed race. Of the remaining two percent: one per cent identified their race as 'Other' whilst the remaining one per cent remained unidentified. The work experience of the students in the sample varied from as little as no experience to as many as 13 years (*M* = 1.79, *SD* = 2.06); the majority of students (31 per cent) had less than one year of work experience, with the second largest number of students (17 per cent) having no work experience at all. Mean student grade point average (G.P.A.) was a high 3.14 (*SD* = .43) out of a maximum of 4.5. Descriptive statistics for the sex and ethnicity of the sample used is available in Table 2.

Table 2: Demographic information for participants in the preliminary study (divided by university).

		University 1		University 2		University 3	
Sex		*N*	*%*	*n*	*%*	*n*	*%*
	Female	31	32	46	44	54	53
	Male	65	67	58	56	48	47
	Total	96	99	104	100	102	100
Ethnicity							
	African	51	53	36	35	16	16
	East-Indian	5	5	38	37	57	56
	Mixed	39	40	27	26	29	28
	Other	0	0	1	1	9	0
	Total	96	99	102	99	102	100

Measures

This study used a three-part questionnaire which consisted of: 1) demographic questions; 2) the Teamwork Competency Test (TWCT); and 3) the Measure of Peer Justice Climate perceptions. *Teamwork competencies* were measured using the Teamwork Competency Test (TWCT) prepared by Aguado et al. (2014). This measure was designed to assess teamwork competencies, and has been widely used in both applied and academic contexts. The measure consists of thirty-six personal questions ($\alpha = .86$) such as: *When I interact with my teammates, I ask questions to better understand what they say*. These personal questions were very situational and required participating students to choose an answer that best represents their behaviour using a four point Likert scale (1 = almost never/never; 4 = almost always/always). The questionnaire intentionally uses a four point scale, so that there is no definite midpoint or neutral answer option for participants. The questionnaire measures participants scores for five competencies within two subcategories: interpersonal teamwork competencies (conflict resolution, collaborative problem solving, communication) and self-

management competencies (goal setting and performance management, planning and task coordination).

The *Measure of Peer Justice Climate* was used for collecting data on participant's peer justice climate perceptions (Rupp, Shapiro, Folger, Skarlicki & Shao, 2017; Li, 2008; Li, Cropanzano & Benson, 2007; Molina, Moliner, Martínez-Tur, Cropanzano & Peiró, 2015; Molina, Moliner, Martínez-Tur, Cropanzano & Peiró, 2016). This measure was compiled by Li (2008) using measures developed separately for procedural, distributive and interactional justice (α = .77). The items that measure distributive peer justice climate are based on a scale (α = .33) developed by George (1992) for determining the extent to which team members contribute equitably to the efforts of the team (example item: *"The grade that my teammates have received for the projects is appropriate considering the quality of the work they have completed").* The items that measure procedural peer justice climate (α = .58) are similar to those written by Colquitt (2001) and evaluate the procedures used within the team (example item: *"The way my teammates make decisions is applied consistently*"). These items were based on criteria initially proposed by Leventhal (1976). The items measuring interactional peer justice climate (α = .76) were developed by Donovan, Drasgow, and Munson (1998) and assess the extent to which teammates treat each other with respect and help each other perform tasks (example item: *"My teammates treat each other with respect"*). The measure used a five point Likert-scale (1 = *strongly disagree*; 5 = *strongly agree*) for all items.

Table 3. List of Measures included in preliminary study.

Variable	*Measure*	*No. of Items*	*IMOI classification*
Peer Justice Climate	Measure of Peer Justice Climate (Li, Cropanzano & Benson, 2007).	14	Emergent state/ moderator
Teamwork Competencies	TWCT (Aguado et al., 2014)	36	Input

Procedure

Undergraduate students were approached in a public place at each of the selected universities. This would have been either at the front of the library, the student administration building or a common study area. Each location was scouted and selected based on the availability of quiet space nearby for completing questionnaires. Interested students were screened by asking if they had recently (within the last academic year) participated in a group project that required the submission of a shared output as well as a shared grade. Students were then briefed on the need to share on their experiences of working in a team and that their information would be kept private and confidential. Participants were instructed to keep in mind the exact same experience whilst answering all questions, so as to ensure that results were not received from a variety of teamwork experiences. All participants were asked to validate their consent to participate by signing a form of informed consent. Screened participants were then ushered to a nearby quiet space where they could spend the next 10 - 15 minutes completing the study's questionnaire. Upon completion, each student was thanked for their willingness to participate and allowed to leave contact details if they wished to receive a follow-up email with any results published from the study.

Data analysis

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were both used to test the dimensionality of the peer justice climate questionnaire (PJCQ) and the Teamwork Competency Test (TWCT). In the case of peer justice climate, the rotation method used was that of unweighted least squares (ULS) estimator, which is the method preferred for use when handling data derived from Likert scales (e.g. Castaño & Izquierdo, 2018; Lloret-Segura *et al.*, 2014). Similarly, the unweighted least squares (ULS) method was used for the TWCT as was recommended by the developers of the measure (Aguado et al., 2014). Model fit of CFAs were evaluated using three types of goodness of fit statistics: 1) absolute goodness of fit, 2) incremental goodness of fit and 3) simplified goodness of fit. Absolute goodness of fit statistics include: Chi-square, Relative Chi-square ($\chi 2$/d.f.),

Root Mean Square Residual (RMR) and the Root Mean Square Error of Approximation (RMSEA). The incremental goodness of fit statistics include the Normed Fit Index (NFI), the Tucker Lewis Index (TLI) and the Comparative Fit Index (CFI). Finally, the simplified goodness of fit statistics include: Akaike's (1973) Information Criterion (AIC) and the Bayesian information criterion (BIC). The Statistical Package for the Social Sciences (SPSS) version 25 was utilized for running EFA, correlational and reliability analyses, while the software packages MPlus and R-Studio were used to run all CFAs.

Results

Validation of the Measure of Peer Justice Climate Perceptions

The complete sample contained 304 undergraduate students (N = 304), average scores for peer justice climate are listed in Table 4, alongside the sample's asymmetry and kurtosis coefficients. The data was found to meet the assumptions of normality. Correlations between the various subscales of the peer justice climate measure and their corresponding alpha values are listed in Table 5. The sum of item responses of the peer justice climate questionnaire ranged from 2.17 to 3.74, with standard deviations for individual items ranging from .89 to 1.19. As the data was collected from three different universities, average student scores on each dimension were compared across universities using a one-way ANOVA. These results showed that there was no significant difference in the scores depending on university of origin thus all subsequent analyses were carried out using the entire sample.

Table 4. Reliability and descriptive statistics for PJCQ Scores in the preliminary study.

Variable	*n*	Min – Max	*M*	*SD*	Asymmetry	Kurtosis
Peer justice climate total	298	14 – 70	44.87	7.37	-.10	.38
Distributive peer justice	301	5 – 25	13.60	2.81	.53	.36
Procedural peer justice	303	5 – 25	17.34	3.08	-.58	.46
Interactional peer justice	301	4 – 20	13.91	3.37	-.41	-.04

The factor analysis with the ULS method used an oblique rotation as variables are linked theoretically, and were expected to be connected by a single, second order justice factor. Three factors were produced (eigenvalue of factor 1, 4.43; factor 2, 2.01; factor 3, 1.34; variance explained by factor 1, 31.66%; factor 2, 14.34%; factor 3, 9.56%), which accounted for 55.57% of the variance. Bartlett's

test of sphericity was significant ($\chi 2$ (91) = 1358.29, $p < .001$), an indication that the data was suitable for using the factor analytic model. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was a satisfactory .82, however, item communalities were quite low and ranged between .19 and .60. Factor loadings were irregular, with various factors loading onto incorrect scales when considering the theoretical model proposed by Li (2008).

Table 5. Correlation between subscales of Peer Justice Climate (PJC).

Variable	α	*M*	*SD*	1	2	3
1. Distributive peer justice	.33	13.60	2.81			
2. Procedural peer justice	.58	17.34	3.08	.39**		
3. Interactional peer justice	.75	13.91	3.37	.31**	.61**	
4. Peer justice climate total	.76	44.87	7.37	.69**	.85**	.83**

***$p < .001$, **$p < .01$, *$p < .05$

Simplification of Peer Justice Climate Measure

On the basis of the poor factor loadings and the relative novelty of the measure it was decided to modify the measure developed by Li (2008) from its original state to suit the sample more adequately. Items were therefore removed from the peer justice climate measure in the attempt to produce a factor structure that would explain more variance (e.g. Molina *et al.,* 2015). To address the cross loading of factors, the decision was taken to eliminate five items (Items: DJ1, DJ2, PJ2, PJ3, IJ1). Items DJ1 and DJ2 originated from the first two items of the sub-scale for distributive peer justice climate; Items PJ2 and PJ3 were from the sub-scale for procedural peer justice climate; and item IJ1 was the first item on the sub-scale for interactional peer justice climate. Item DJ1 was eliminated for the negative factor loading it produced compared to the other positively loaded items on the same factor,

whilst items DJ2, PJ3 and IJ1 were eliminated due to their consistent loadings onto the wrong factor regardless of the method used, without having a comparable loading on the expected factor, as was the case with item IJ4 (see Table 6). Item PJ2, the second item of the procedural peer justice climate scale, was retained in the first instance, but was eventually also eliminated as it consistently had a low factor loading.

An EFA using the ULS method of extraction was done for the simplified measure and produced three factors which explained a total of 67.26% of variance, eleven percent more than the previous version of the measure (eigenvalue of factor 1, 3.21; factor 2, 1.77; factor 3, 1.08; variance explained by factor 1, 35.65%; factor 2, 19.64%; factor 3, 11.97%). The *KMO* was .75 and Bartlett's test: $\chi 2$ (36) = 837.91, $p < .001$, indicating that conditions were adequate for the EFA. For the sake of comparison an analysis using the MLE was done, however, results were identical and are therefore not reported. The measure with the omitted items produced better factor loadings, which was in keeping with expectations. Distributive peer justice climate items loaded onto the first factor, interactional peer justice climate items onto the second, and procedural peer justice climate items onto the third, with only one instance of cross loading (IJ4); which also happened to be the lowest factor loading of all. Factor loadings of the simplified peer justice climate measure using the ULS are reproduced in Table 6.

The value for Cronbach's alpha for the complete Peer Justice Climate Questionnaire was acceptable, at .76 however, when item DJ1, related to distributive peer justice climate was removed from the analysis the alpha scores of all items increased with the overall scale alpha increasing to .82 (Item DJ1 – *Some of my teammates received a better grade for the course/coursework than they would have deserved*). The consistency of the simplified version of the measure was .77 a marginal increase compared to the original score, however, with greater consistency within each of its subscales.

In preparation for the carrying out of the confirmatory factor analysis (CFA), the Tucker and Lewis indices (*CFI*, and *TLI*); root mean square error of approximation (RMSEA); and the $\chi 2$/degree of freedom ratio were calculated to be used as the basis for comparing which model had the best fit (Browne & Cudeck, 1993; Hoyle, 1995; Hu & Bentler, 1999). The model fit for the one-dimensional model, three-dimensional model and the three-dimensional model using the simplified

measure are compared in Table 7. The one dimensional model was included as it was proposed in the literature to be the most likely competing model of peer justice climate.

Table 6: EFA factor loadings using the ULS method for the simplified PJC measure.

		Factors		
		1	2	3
PJC Items	DJ.3	.784		
	DJ.4	.829		
	DJ.5	.768		
	PJ.1			.491
	PJ.4			.534
	PJ.5			.595
	IJ.2		.509	
	IJ.3		.976	
	IJ.4		.414	*.619*
	α	.85	.74	.57

Note: N= 300; Loadings lower than .400 were omitted.

Loadings in a different factor from expected are highlighted in italics

The structure of the peer justice climate measure was examined using confirmatory factor analysis (CFA). The simplified three-dimensional model for peer justice climate, which separated peer justice climate perceptions into distributive, procedural and interactional justice dimensions ($\chi 2 = 27.05$, $df = 24$, $p > .05$; $\chi 2/df = 1.127$; *CFI* = .995; *TLI* = .992; *RMSEA* = .021), showed a good fit for the data. To replicate the structure proposed by Li (2008) of the three peer justice climate dimensions as being a part of a single 'second order justice factor' a CFA was run which included a second-order structure.

The results were the same as with the three-dimensional model ($\chi 2 = 27.05$, $df = 24$, $p > .05$; $\chi 2/df = 1.127$; *CFI* = .995; *TLI* = .992; *RMSEA* = .021) showing no improvement of fit. Results for the modified questionnaire show an improvement over the original questionnaire. Table 7 shows the full details for all the fit indices of the models tested. Results for the modified questionnaire show good support for hypotheses one and two, whereas the original questionnaire did not provide evidence good enough to clearly support the second hypothesis.

The simplified peer justice climate structure was then used to calculate participant scores for each of the peer justice climate sub-scales (distributive, procedural, interactional) as well as an overall score on peer justice climate. These new values were preferred for use in the main study as its participants are expected to share characteristics with the sample from the preliminary study. The updated correlations between the subscales of the peer justice climate measure are shown in Table 9.

Table 7: Fit Indices of various peer justice climate structures using the MLE method in the EFA.

Fit Index	Model		
	1 Factor	3 Factor	3 Factor (simple)
NFI	0.55	0.91	0.97
CFI	0.58	0.95	0.98
TLI	0.50	0.91	0.95
RMSEA	0.15	0.07	0.06
χ2/Df	7.95	2.33	2.20

The fit indices may be interpreted as follows: Tucker and Lewis indexes (*CFI*, and *TLI*): values of .90 – .95 indicate acceptable fit and values above .95 indicate good fit; Root mean square error of approximation (*RMSEA*): values of .05 or lower indicate a well-fitting model, values of .05 to .08 a moderate fit and .10 or greater a poor fit; and χ2/Degree of freedom ratio: values between one and three indicate a great fit, with values below five being acceptable (Carmines & Mclver, 1981; Jöreskog, 1970).

Table 8: Fit indices of various peer justice climate structures using CFA.

Fit Index	Model			
	1 Factor	3 Factor	3 Factor (simple)	3 Factor & second order factor
χ2	407.593	226.146	27.052*	27.052*
Df	77	74	24	24
TLI	0.607	0.812	0.992	0.992
CFI	0.667	0.847	0.995	0.995
AIC	13220.56	13045.114	8878.317	8878.317
BIC	13375.84	13211.483	8989.230	8989.230
RMSEA	0.120	0.083	0.021	0.021
χ2/Df	5.293	3.056	1.127	1.127

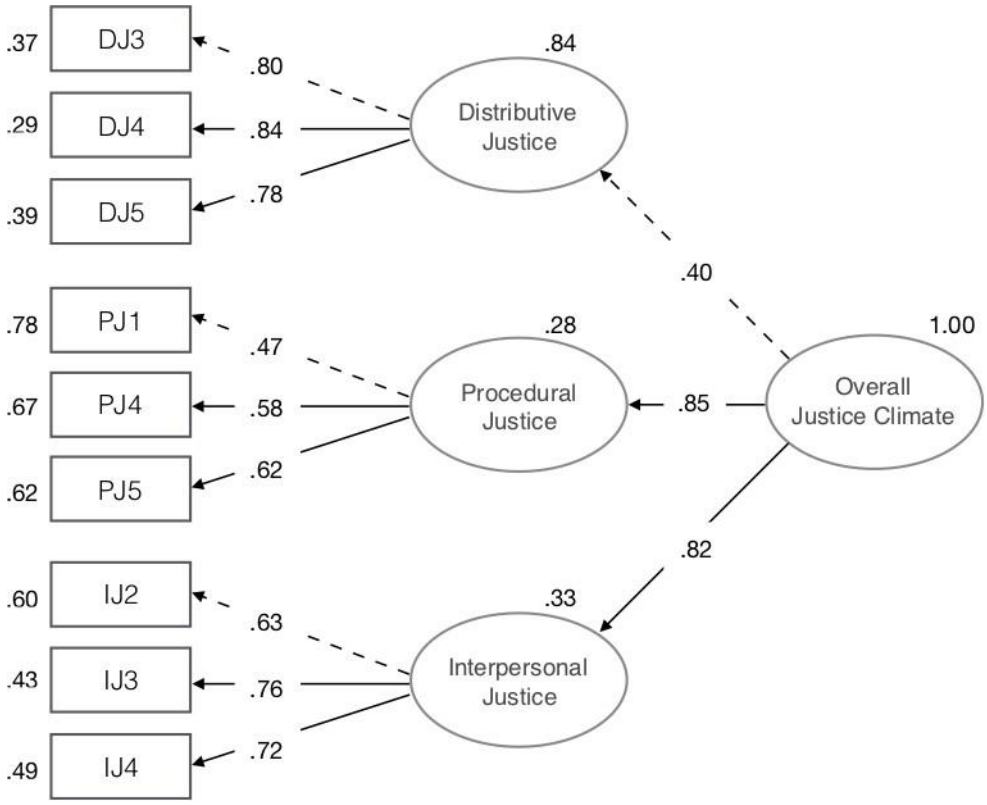
****p* < .001, ***p* < .01, **p* < .05

Table 9: Correlation between subscales of Simplified Peer Justice Climate measure (PJC).

Variable	*A*	*M*	*SD*	1	2	3
1. Distributive peer justice	.85	6.71	2.83			
2. Procedural peer justice	.57	10.75	2.07	.22**		
3. Interactional peer justice	.74	10.24	2.78	.27**	.44**	
4. Peer justice climate total	.77	27.70	5.66	.72**	.69**	.79**

** – Correlation is significant at the 0.01 level (2-tailed).

Figure 3. Standardized estimated for the three-factor model of the PJCQ which includes a second order overall peer justice factor.



Validation of the Measure of Teamwork Competency Test (TWCT)

Average scores for the TWCT are listed in Table 10, alongside the sample's asymmetry and kurtosis coefficients. Correlations between the various teamwork competencies measured by the TWCT and their corresponding alpha values are listed in Table 11. The sum of item responses of the TWCT ranged from 71 to 133; interpersonal competencies ranged from 45 to 87 and self-management competencies ranged from 16 to 52 . Cronbach's alpha for the scale was .86. The factor analysis with the ULS method using an Oblimin-Kaiser rotation caused 11 factors to emerge with eigenvalues greater than 1.00, accounting for 56.84% of variance. Bartlett's test of sphericity was significant ($\chi 2$ (630) = 2035.14, $p < .001$), an indication that the data was suitable for using the factor analytic model. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was a satisfactory .82, with item communalities ranging between .18 and .47.

Table 10. Reliability and descriptive statistics for TWCT Scores in the preliminary study.

	n	Min – Max	*M*	*SD*	Asymmetry	Kurtosis
Interpersonal Competencies	267	23 – 84	67.76	7.46	-.19	.22
Conflict Resolution	292	8 – 24	22.84	3.59	-.24	.25
Collaborative Prob. Solv.	300	5 – 20	13.77	1.97	.14	-.06
Communication	279	10 – 40	30.92	3.86	-.39	.57
Self-Management Competencies	293	13 – 52	38.73	5.41	-.38	.70
Goal Set. & Per. Mgmt.	296	7 – 28	19.81	3.39	-.28	.39
Plan & Task Coordination	301	6 – 24	18.93	2.69	-.62	.72
Overall TWCT	257	36 – 144	106.69	11.39	-.31	.01

Table 11. Descriptive Statistics and inter-correlations for TWCT and KSAs

Variable	*M*	*SD*	*α*	*1*	*2*	*3*	*4*	*5*	*6*
1. Interpersonal KSAs	67.76	7.46	.78						
2. Conflict Resolution	22.84	3.59	.66	.86**					
3. Collaborative Prob. Solv.	13.77	1.97	.17	.53**	.27**				
4. Communication	30.92	3.86	.69	.87**	.61**	.25**			
5. Self-Management KSAs	38.73	5.41	.80	.64**	.59**	.31**	.56**		
6. Goal Set. & Per. Mgmt.	19.81	3.39	.71	.51**	.50**	.31**	.40**	.91**	
7. Plan & Task Coordination	18.93	2.69	.66	.61**	.56**	.24**	.60**	.85**	.56**

***$p < .001$, **$p < .01$, *$p < .05$

The 36 questions of the TWCT make up 14 KSAs which fall into five major categories or teamwork competencies. For example, the teamwork competency known as 'conflict resolution' is comprised of the following three KSAs: 1) the KSA for recognizing team conflict; 2) the KSA for recognizing the type and source of conflict and implementing conflict resolution strategies; and 3) the KSA for employing integrative (win-win) negotiation strategies. See *Table 1* for a complete list of the five teamwork competencies and KSAs that comprise them.

The expectation for a factor analysis was that the 36 items of the TWCT would be grouped according to the 14 KSAs, therefore, the an exploratory factor analysis (EFA) should produce 14 factors with eigenvalues greater than 1.00. This, however, was not the case as the EFA produced only 11 factors with eigenvalues greater that 1.00. A similar result was produced in a recent study done to verify the dimensionality of the TWCT (Aguado, et al., 2014). Aguado and colleagues explained that the reason why fewer than 14 factors were reproduced using an EFA was due to a strong association between the items that represent the KSAs of the communication competency and the items that represent the KSAs of the conflict resolution competency. In light of this explanation the 11 factors reproduced by the EFA in this study were reviewed to determine if the items within them were grouped in way that was

consistent with the five competencies that were meant to be represented by the 14 KSAs. Thus, a comparison was made to verify that the 11 factors matched five overall competencies in a way that was consistent with how the 14 KSAs match the five overall competencies.

A comparison of the 11 factors produced by the EFA and the five teamwork competencies demonstrated that the items with the 11 factors were loaded in such a way that was consistent with the substantive model proposed by Stevens and Campion (2004). Factor loadings can be found in Table 12 and the comparison between the items that comprise the 11 factors and the five teamwork competencies can be found in Table 13.

As expected of the first three major competencies known as Interpersonal Competencies, there were no factors to distinctly represent two of the KSAs within the teamwork competency for 'communication'. The absence of these factors was due to an overlap with the factors representing 'Conflict Resolution'. Also, the competencies 'goal setting and performance evaluation' and 'planning and task coordination' are each represented by two KSAs (for a total of four), however, the EFA shows that each of these competencies were only represented by one factor (for a total of two). This was because the items that were expected to load onto four separate factors (two factors representing each competency) were instead loaded onto only two factors with only one factor representing each competency.

The comparison demonstrated that the factors produced by the EFA were a reasonable representation of the substantive model proposed by Stevens and Campion (2004) upon which the TWCT measure is based. There were less factors than KSAs due to the grouping of items representing similar KSAs into the same factor.

Table 12. Exploratory Factor Analysis loadings for the methods of unweighted least squares (ULS) for the Teamwork Competency Test (TWCT).

	Factor										
Item	1	2	3	4	5	6	7	8	9	10	11
17	**.533**										
6	**.526**										
18	**.425**		-.218					.201			
31	**.309**	**.270**									
4	**.260**	.228									
32		**.591**		-.224							
36	.201	**.578**			.272				-.219	-.231	
35		**.541**									
30		.214									
25			**.444**								
29			**-.417**								
12			**.333**	-.287		.249					
27			**-.257**								
26				**-.610**							
33		.286		**-.307**					.214		
15					**.584**						
19					**.300**			.223			
28			-.239		**.292**					-.240	
24					**.258**						
9						**.788**					
8						**.443**					
5											
14							**.842**				
21								**.649**			
22							**.219**	**.402**			
20		.221						**.402**		**-.337**	
3				-.284				**.307**			-.220
10								**.209**			
11									**.657**		
23	.208									**.461**	
34		.261	-.205							**.300**	
13	.253			-.206						**.276**	
1											**-.634**
16				.219	**.320**						**-.521**
2				-.215							**-.385**
7	.271										**-.375**

Table 13. Teamwork Competencies represented by the 11 factors from an EFA.

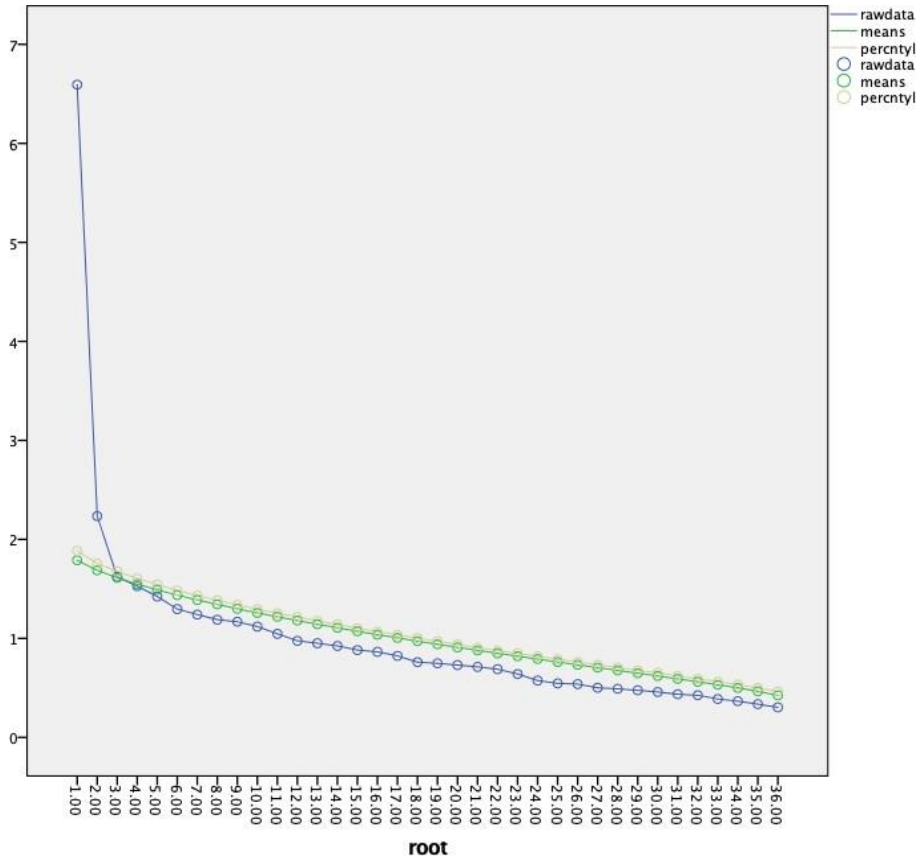
	Factor No.	*Items loaded on factor*	*Expected Items (theory)*
Interpersonal Competencies			
Conflict Resolution	5	15, 16, 19, 24, 28	**1**, **3**, **7**, **10**, **15**, **16**, **19**, **21**
	8	3, 10. 20, 21, 22	
	11	1, 2, 7, 16	
Collaborative Problem Solving	4	26, 33	**11**, **14**, 24, 25, **26**
	7	14, 22	
	9	11	
Communication	1	4, 6, 17, 18, 31	2, 5, **8**, **9**, **12**, **17**, **27**, 28,
	3	12, 25, 27, 29	**29**, 30
	6	8, 9	
Self-Management Competencies			
Goal Setting & Performance Mgmt.	2	30, 31, 32, 35, 36	6, 20, 22, **31**, **32**, **35**, **36**
Planning & Task Coordination	10	13, 23, 34	4, **13**, 18, **23**, 33, **34**

Items in bold are those from theory which were represented on the factor loadings of the EFA

Confirmatory factor analyses (CFA) were used to which model best represented the data. The authors of the TWCT proposed a five factor model with two second order factors representing the categories: interpersonal competencies and self-management competencies. This was compared to the a simple five factor model, without the second order categories, to investigate if it fit the data better.

A parallel analysis was also used to verify the number of eigenvalues that should be extracted from the data, the results showed that only two factors meet the criteria for being retained, however there were 11 factors that maintained an eigenvalue greater than 1.00. As the parallel analysis indicated that two factors should be retained, a two-factor model was included for testing. The items of the measure were separated into the two categories: interpersonal competencies and self-management competencies. These categories were then used to create the two-factor model.

Figure 4. Factors extracted using a parallel analysis



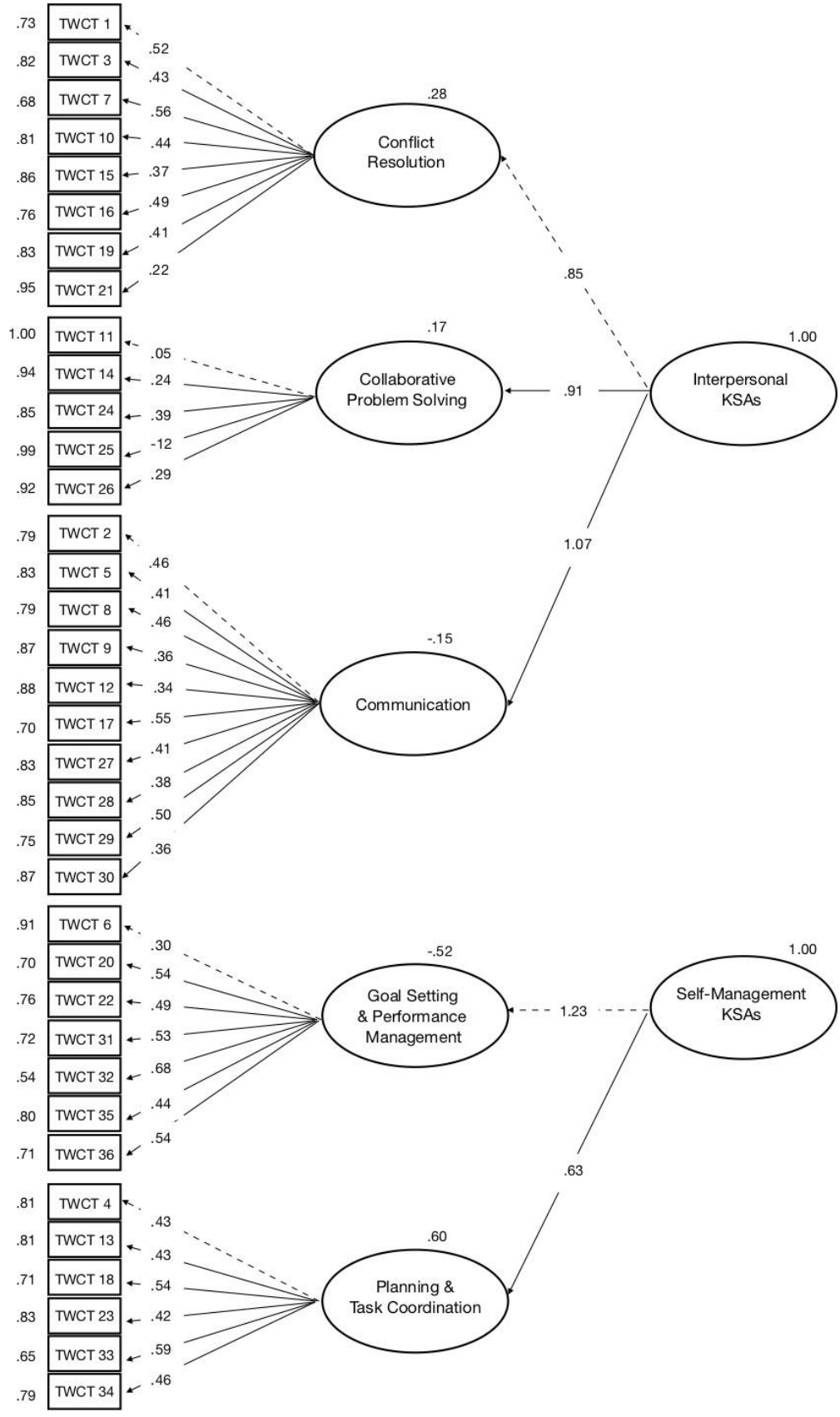
The five factor model which included two second order factors grouping the five competencies into two categories showed a decent fit $\chi 2 = 939.44$, $df = 588$, $p < .01$ ($\chi 2/df = 1.60$) with a standardized root mean squared residual of .065 and a *RMSEA* of .048. The comparative fit index (*CFI*) was .769 and the Tucker-Lewis (*TLI*) was .752. In the first CFA the second order factors were allowed to be correlated, however, for comparison, another CFA was run which forced the two second order factors to be uncorrelated (orthogonal). The model fit was moderate $\chi 2 = 1106.77$, $df = 589$, $p < .01$ ($\chi 2/df = 1.88$); *SRMR* = .12; *RMSEA* = .058; *CFI* = .660 and *TLI* = .636. The results were very similar for the five factor model which did not include any second order factors whatsoever ($\chi 2 = 927.51$, $df = 584$, $p < .01$; $\chi 2/df = 1.59$; *CFI* = .774; *TLI* = .756; *RMSEA* = .048). The two-factor model was also run with the both factors correlated as well as with both factors uncorrelated. The fit of the correlated two factor model was, $\chi 2 = 994.62$, $df = 593$, $p < .01$ ($\chi 2/df = 1.68$), *SRMR* = .067 and *RMSEA* = .051; *CFI* = .736 and *TLI* = .719. The model with the uncorrelated factors produced better results ($\chi 2 = 1131.68$, $df = 594$, $p < .01$; $\chi 2/df = 1.91$; *CFI* = .646; *TLI* = .625; *SRMR* = .121; *RMSEA* = .059). The results for the various models compared can be found in Table 14. The five factor model which included the two second order factors was considered to be the best overall fit for the data, and thus, hypothesis H3 was confirmed.

Table 14. Fit indices of various TWCT models using CFA.

TWCT Model	*RMSEA*	*χ2/df*	*CFI*	*TLI*
Five factor and second order (correlated)	.048	1.60	.769	.752
Five factor and second order (orthogonal)	.058	1.88	.660	.636
Five factor (no second order factors)	.048	1.59	.774	.756
Two factor (correlated)	.051	1.68	.736	.719
Two factor (orthogonal)	.059	1.91	.646	.625

The fit indices may be interpreted as follows: Tucker and Lewis indexes (*CFI*, and *TLI*): values of .90 – .95 indicate acceptable fit and values above .95 indicate good fit; Root mean square error of approximation (*RMSEA*): values of .05 or lower indicate a well-fitting model, values of .05 to .08 a moderate fit and .10 or greater a poor fit; and χ2/Degree of freedom ratio: values between one and three indicate a great fit, with values below five being acceptable (Carmines & Mclver, 1981; Jöreskog, 1970).

Figure 5. Standardized estimated for the five-factor model of the TWCT which includes a two second order factors (orthogonal).



Discussion

The preliminary study attempts to support the main study by providing details about the validity and structure of two of the measures used in this dissertation: the peer justice climate questionnaire (PJCQ) and the teamwork competency measure (TWCT). These measures, along with the measure for Shared Leadership, are the basis for the variables used in many of the hypotheses in this dissertation. The preliminary study takes a moment to look more closely at these measures in an attempt to emphasize the importance of construct validity without complicating the ambitions of the main study. Further, as neither of these measures have been utilized formerly in the country of Trinidad and Tobago, it was necessary to carry out a preliminary study to ensure the validity of the measures.

Hypothesis *H1* tried to verify a three-dimensional structure of peer justice climate perception as opposed to a one-dimensional structure. This was important for two main reasons: 1) the measure had been recently developed and replication of results was important to determine its robustness; 2) to determine how well the measure is able to maintain the expected structure when used with a multi-ethnic sample. Findings showed a three-dimensional structure of peer justice climate (distributive, procedural and interactional) to be a superior fit for the data than a one-dimensional structure (Li, Cropanzano and Bagger, 2013). These findings confirm the hypothesis and are also in line with the findings of the limited available recent examples of peer justice climate research (Molina *et al.*, 2015; Molina *et al.*, 2016).

Hypothesis *H2* investigated if the three dimensions of peer justice climate were indicators of an overall peer justice climate factor. The results of CFA supported this model; however, the three-dimensional model that included a second order justice factor did not seem to fit the data significantly better than the more parsimonious three-dimensional model without the second order justice factor. Both of these models maintained the same values for the various fit indices tested. Though it may be common practice to select the simpler model instead of the more complex one, there is some justification for preferring the model which includes the second order factor as it explains more of what is happening on a theoretical level. This is to say that the model which includes a second order justice factor offered a better theoretical explanation for the high correlation between justice dimensions than

the model without it. Finally, it is important to note that both hypotheses were supported when the simplified version of the measure, which included nine items (three for each dimension), was utilized. The original measure produced poorer results when used within a multi-ethnic sample.

With respect to the original measure, the data showed that although three distinct dimensions were produced, participant responses caused some items to load onto dimensions not consistent with what they were expected to measure. This error in loading should not occur when considering the claims of Cohen-Charash and Spector (2001), which propose that participants should be able to distinguish between the various dimensions of peer justice climate despite their strong association. Thus, although the data gained using the original measure fit the three-dimensional model, the fit of the model was significantly improved when the measure was simplified by eliminating a few items. The changes made to the original measure also caused a few other effects. There was an increase in the alpha levels of the subscale for distributive peer justice climate, whilst the other subscales maintained more or less stable alpha levels. The alpha level of the entire scale also increased from .76 to .77, indicating a marginal improvement in internal consistency. Further, the simplified scale caused a reduction in the strength of the correlations of the three subscales with each other (Table 9), this allows for a clearer distinction between scales and perhaps, with further research, can allow for making better distinctions of the relation that each peer justice climate dimension has with antecedent or outcome variables.

The need to eliminate several of the items to allow for a more internally consistent model suggests that if the items of the original measure are to be retained, they may need to be clarified for use in new contexts such as multi-ethnic societies. Note that multi-ethnic societies, by their diverse nature, may be subject to a greater variety of interpretations for the items within the measure. This variety of interpretations occurs as a result of the difference in cultural backgrounds and the distinct meanings or interpretations assigned to similar stimuli. Differences in interpretation may have been the case, for example, with the first item of the subscale for distributive peer justice climate (Item DJ1). This item seriously affected the internal consistency of the subscale, as well as the ability of the entire measure to fit the model. On the other hand, though the results obtained from this item may be considered as a potential ‘bad reading’ due to cultural diversity; research done by Molina *et al.* (2015)

also encountered poor responses to this item without the cultural diversity element. Thus, one must remain open to the possibility that responses may have been affected by a variety of unknown factors.

The teamwork competency test (TWCT) produces a multi-level representation of teamwork competencies. At the base, the test investigates fourteen somewhat distinct KSAs that are representative of various behaviours needed for collaborating successfully with others in the workplace. These fourteen KSAs can then be grouped into the five teamwork competencies that make up the next level: conflict resolution; collaborative problem solving; communication; goal setting and performance management; and planning and task coordination. The five competencies can be further categorized into Interpersonal Competencies (conflict resolution, collaborative problem solving, communication) and Self-Management Competencies (goal setting and performance management, planning and task coordination). At the most global level the TWCT provides an overall score on a person's teamwork competencies. Although there are uses for the overall competency score, such as making omnibus comparisons with other variables, the TWCT is most useful for its ability to detect the five underlying competencies.

Hypothesis *H3* sought to verify that the TWCT would successfully detect five distinct teamwork competencies. Results of the EFA determined that there were 11 factors, which were too many to be representative of the five teamwork competencies but too few to be an accurate representation of the 14 individual KSAs which make up these competencies. Upon further investigation of the items that were loaded onto these 11 factors it was found that the factor loadings were representative of most of the fourteen KSAs, however in some instances two competencies were grouped together causing only 11 factors to be represented. As mentioned briefly in the results section, previous studies have been hard pressed to find 14 distinct factors with either the TWCT or the TWKSAT test that preceded it.

Research by Aguado and colleagues (2014) to validate the measure used an interesting approach for interpreting the number of factors found. The approach used was to consider two main ideas: first, that items from a particular competency remined clustered together within a factor; and second, that any cross loadings would occur only between related competencies, e.g. competencies both considered as interpersonal or as self-management. As the 11 factors found in the preliminary study

were less than the expected 14 KSAs, it was suspected that there were cases of two KSAs loading onto the same factor. Upon inspection, this was found to be the case for the KSAs of the self-management competency. The two self-management competencies should have been comprised of two KSAs each, for a total of four KSAs. Our data, however, showed that the items from these four KSAs were all loaded onto only two distinct factors, one for each teamwork competency.

Another reason for the consolidation of factors was that the existence of a strong congruence between the Conflict Resolution items and the Communication items. This is to say that it was difficult for a factor analysis and also for an expert judge to differentiate between these two competencies. The authors, therefore, suggested that a reconfiguration of one of the communications KSAs into the conflict resolution competency could help with interpretation. This was also found to be true of the data from this study as the items linked to the KSAs within the communication competency were loaded onto KSAs within the conflict resolution competency.

The above-mentioned considerations assisted greatly with the interpretation of the results of the EFA as it allowed for more flexibility when deciphering factor loadings. The results showed that the 11 factors found could therefore be grouped cleanly into the five expected teamwork competencies with only two caveats: 1) some factor loadings were quite low (as low as .25) and 2) there were several negative factor loadings. Confirmatory factor analyses were used to test three main models: 1) a five-factor model, 2) another five-factor model with two second order factors and 3) a two-factor model. The second order factors were representations of the categories interpersonal and self-management competencies. The two-factor model also divided items into these same categories.

Overall, no model produced an outstanding fit for the data, however, of the available models, the five-factor model which included the two second order factors was the best. This model was proposed by the authors of the measure and, as such, this study remained consistent with previous findings whilst also supporting hypotheses *H4*.

Conclusion

In sum, the PJCQ originally proposed by Li (2008), and used in various studies (e.g. Cropanzano *et al.*, 2011; Li, Cropanzano and Bagger, 2013; Molina et al., 2015; Molina *et al.*, 2016), can be used for the study of peer justice climate perceptions within a multicultural context, although it may be necessary to eliminate some of the items initially proposed or modify the measure in some other way. Also, the TWCT, demonstrated its ability to detect five teamwork competencies, as well as, the two major categories of competencies. Some care should be taken when considering results provided with the TWCT as there are issues with low factor loadings, factor cross-loadings and ambiguities between the conflict resolution and communication competencies. The main study will use the simplifies PJCQ as it has been modified by this preliminary study.

- Chapter 4 -
Main Study

Hypotheses – Main Study

This objective of the main study was to expand the range of outcome variables predicted by teamwork competencies via the use of the TWCT. Specifically, this study sought to investigate if teamwork competencies can be related to peer justice climate and to shared leadership at both the individual and team levels of measurement. A link between these variables will be made based on their dependence on behaviour and the observance of behaviour. One of the main reasons for investigating this relation is that various outcome variables are based upon the expression of behaviours that comprise teamwork competencies. If this is found to be true, then the practice of measuring teamwork competencies upon forming new teams can potentially be useful for predicting various team based outcomes.

Teamwork competencies can be measured using the teamwork competency measure (TWCT). The TWCT was developed to evaluate an individual's levels of teamwork competencies along two domains: interpersonal competencies and self-management competencies. The evaluations are made using a questionnaire of 36 items which evaluate the likelihood to behave in a certain way or not under various circumstances. The competencies measured by the TWCT are usually used as predictors of both individual (McClough & Rogelberg, 2003; Schmidt & Hunter, 1983) and team level (Aguado, Rico, Sánchez-Manzanares & Salas, 2014) performance. As this study proposes an expansion of the current understanding of teamwork competencies as predictors of performance to understanding them as predictors of various team level outcomes. The theoretical foundations for such a connection must be established.

Teamwork competencies are categorizations of behaviours that are consistently carried out by an individual when working with others. These behaviours are at the heart of the theoretical links between teamwork competencies and other variables. Another important factor is the teamwork process. Teamwork competencies can be linked to the outcomes shared leadership and peer justice climate based on the understanding of what is a teamwork process.

To explain a bit about the teamwork process, Marks, Mathieu and Zaccaro prepared a taxonomy where they defined teamwork processes as member's interdependent acts that convert inputs to outcomes through cognitive, verbal, and 116ehavioural activities directed toward organizing taskwork to achieve collective goals (2001, p. 357). Though quite accurate, the following definition may serve for an ease of understanding, "teamwork processes are interactions such as communication and conflict that occur among group members and external others," (Cohen & Bailey, 1997, p. 244). Marks and colleagues (2001) went on to situate teamwork processes within a larger framework of the team's life cycle and emphasized that teamwork occurs via various important performance episodes that included several I-P-O-type cycles that run sequentially and simultaneously. Thus, they proposed a *recurring phase model* of team processes which outlines how temporal factors impact team functioning and how time-based rhythms act to shape how teams manage their behaviour.

Teamwork processes can be placed into three superordinate categories of processes: *transition*, *action*, and *interpersonal*. During the transition processes, team members focus on activities such as mission analysis, planning, goal specification, and formulating strategies. Later, during action processes, members concentrate on task accomplishments, monitoring progress and systems, coordinating team members, as well as monitoring and backing up their fellow team members. The final and potentially most important category is the interpersonal, which includes conflict management, motivation, confidence building, and affect management. There are several similarities between the three categories of teamwork processes and the behaviours which express the teamwork competencies as elaborated by Stevens and Campion (1994).

To elaborate on the idea of similarities between teamwork competencies and the various teamwork processes we can make the following connection in the literature. Transition processes are similar to the competency for planning and task coordination. Transition processes include activities such as mission analysis, planning, goal specification, and strategy formulation; whilst the competency for planning and task coordination encompasses the knowledge, skills and attitudes necessary for coordinating and synchronizing activities, information, and task interdependences.

Action processes bears a likeness to the competencies goal setting and performance management. Action processes include task accomplishments; monitoring progress and systems; coordinating team members; and monitoring team members; whilst goal setting and performance management includes establish specific team tasks, monitoring and evaluating individual and team performance; and providing feedback to team members.

Finally, the interpersonal processes includes can be likened to the interpersonal competencies: conflict resolution and communication. Interpersonal processes include conflict management, motivation, confidence building, and affect management whilst interpersonal competencies includes conflict resolution and communication. Conflict resolution is comprised of the KSAs for recognizing team conflict and employing adequate conflict management solutions, whilst communication is comprised of the KSAs for communicating openly and supportively.

As described above, the behaviours outlined by teamwork processes and teamwork competencies are incredibly similar. There is, however, one important difference between the two concepts which is that teamwork competencies highlight the internal processes that lead to a particular group of behaviours whilst teamwork processes categorize this specific group of behaviours as they are executed within the team context over a given period of time. This difference sets the stage for the suggestion that for teamwork processes to unfold within the team context, teamwork competencies must exist at the individual level.

Teamwork competencies can be considered, in some sense, as necessary elements for the undertaking of teamwork processes. This connection was alluded to by (Marks et al., 2001), though not elaborated as it has been here. Marks and colleagues did however emphasize that even though teamwork competencies may be necessary for teamwork process not all are necessary at the same time or at all times (2001).

As teamwork processes convert inputs into outputs, teamwork competencies facilitate the behaviours involved. Teamwork competencies may be thought of as influencing the type and frequency

of action and interactions carried out within any teamwork process as persons with more developed teamwork competencies should be responsible for making more meaningful contributions to team related activities. On this basis, this study would like to propose that, teamwork competencies may be understood as an input to various teamwork process, which in turn contribute to various outputs.

The relation between teamwork competencies and teamwork processes provide a good starting point for considering a relation between teamwork competencies and other outcome variables. This study will use a similar rationale to propose that, just like teamwork processes, shared leadership and peer justice climate depend on the successful elaboration of various team based behaviours and interactions. The interactions and behaviours that are responsible for developing shared leadership or for shaping the peer justice climate are likely to be the same interactions and behaviours that are measured by the TWCT in determining the teamwork competencies. In prior literature, both Shared Leadership (Boies et al., 2010; Carson et al., 2007; Hoch et al., 2010b;) and Peer Justice Climate Perceptions (Cropanzano, Li & Benson, 2011) have been described as outcomes of teamwork processes. Therefore, there is some premise for establishing a link with teamwork competencies at both the individual and team levels.

Interpersonal activity is a good starting point for connecting the teamwork competencies to shared leadership. Researchers Hoch and Pearce (2010b) emphasized the role of team coordination in establishing a connection between shared leadership and team effectiveness. Team coordination is one of the major competencies necessary for team work (Stevens & Campion, 1999; Aguado et al., 2014). Team coordination is understood as "team-situated interactions aimed at managing individual team member expertise […] via patterned interactions and practices in particular situations" (Faraj & Sproull, 2000, p. 1555). Meanwhile, the teamwork competency for planning and task coordination, explores the ability of an individual to "coordinate and synchronize activities, information, and task interdependencies between members." Teamwork competencies and shared leadership seem to both operate within a theoretical space that connects them to interpersonal interactions and the coordination of efforts between persons.

The TWCT measures teamwork competencies via self-reports on the likelihood to express certain relevant behaviours (Aguado et al., 2014), it is to be noted that these behaviours include interactive behaviours that precipitate shared leadership. Thus, to put it simply by using the example of the competency 'planning and task coordination': the behaviours that are observed and understood as a reflection of planning and task coordination may be those same behaviours that express a person's participation in the process of shared leadership. This thesis suggests that if these behaviours are consistent with each other, then measures of teamwork competencies should also predict the presence of shared leadership. The expectation is that a relation between a person's competency for planning and task coordination and their subsequent involvement in interaction due to this competency result in the development of shared leadership. Further, this expected relation is expanded by the first hypothesis to include the full range of teamwork competencies (interpersonal and self-management competencies), as they are expected to be, in a similar way to the planning and task coordination competency – related to shared leadership. Teamwork competencies are measured at the individual level, however, shared leadership is measured at the team level. To ensure that these variables can be compared, in individual perception of leadership was introduced as a unitary observance of the shared leadership observed in a person's respective team.

H5 – A positive relation will be observed between teamwork competencies and individual perceptions of leadership.

In the case of peer justice climate, this study proposes that individual peer justice perceptions are based upon how team members perceive the behaviours of their peers as they interact with each other. Interpersonal competencies reflect a person's ability to interact in a positive and effective manner with his or her peers (Seers, 1989). Also, interactional peer justice climate perceptions are based upon how persons are treated by others (Li, Cropanzano and Bagger, 2013). Positive treatment has been associated with more positive justice perceptions (Cardona, Lawrence, & Bentler, 2004). In this way, teamwork competencies, as expressions of respectful and appropriate team interaction can be the basis of justice perceptions. It is expected that behaviours that make up teamwork competencies, are likely

to be considered as positive contributions to the team environment. The potential indirect relation between teamwork competencies and individual peer justice perceptions, based on the likelihood of teamwork competencies being perceived positively by team members, is the basis for the next hypothesis which predicts that teamwork competencies are related to individual peer justice perceptions.

H6 – A positive relation will be observed between teamwork competencies and individual peer justice perceptions.

Teamwork competencies (Aguado et al., 2014; Stevens & Campion, 1994) and teamwork processes (Marks, Mathieu and Zaccaro, 2011) have both been linked to team performance. This study, therefore, sought to confirm the effects of teamwork competencies on performance by hypothesizing that there is a positive relation between the two variables (Stevens & Campion, 1999). The following hypothesis will therefore test the proposed variables at the individual level.

H7 – A positive relation will be observed between teamwork competencies and individual performance.

The second part of the main study will focus on the relation between variables at the group level. As such instead of using individual perceptions of leadership and peer justice the following hypotheses will be tested using the group level variables: shared leadership and peer justice climate. The teamwork competency differential will be used for group level comparisons of how the arrangement of teamwork competencies among individuals within the same group can affect group level outcome variables. The teamwork competency differential is the variance in the perceived levels of teamwork competencies reported by each of the members of a team. Because prior research has not yet observed the possible interactions of the variance among team member's competencies and other outcome variables, an objective of this part of the study is to gain insight through the joint examination of these factors. It is expected that as the teamwork competency differential changes, there will be effects on the intensity of various group level outcomes observed.

First, in a similar way to the teamwork competencies measured at the individual level, the teamwork competency differential is expected to be positively related to team performance. Teams wherein all members have a high level of teamwork competencies are expected to perform better than the teams in which all the individuals have low levels or mixed levels of teamwork competencies.

H8 – The teamwork competency differential is expected to be positively related to team performance.

A relation between the teamwork competency differential and team performance is an important first step in understanding the interconnectedness between teamwork competencies and other group level variables. As other group level variables have been demonstrated to share a relation with team performance, there is some hope that these variables may also relate to the teamwork competency differential. For instance, as peer justice climate has been found to be related to team performance (Konovsky & Cropanzano, 1991), some inquiry can be made to determine if this relation between peer justice climate and team performance will have any effect on the way the teamwork competency differential and team performance are related.

At the group level peer justice climate perceptions are affected by the expression of behaviours that impact positively or negatively on group members. As members perceive that they are in a fair

environment, they are expected to participate more by expressing more positive team behaviours thus contributing to better team performance. Alternatively, when members perceive that they are in a negative peer justice climate, they are expected to participate less by expressing less team behaviours, therefore, leading to diminished team performance.

These positive or negative peer justice climate perceptions are then expected to interact with the competency differential of a team. The differential, represents how similar or differently members are in terms of their teamwork competencies. When a team has a high teamwork competency differential, it is expected that team members differ significantly, whilst a low teamwork competency differential should indicate a minimal difference between team members. Taken in tandem with our understanding of how peer justice climate is expected to affect team member behaviour, the relation between the teamwork competency differential and team performance is expected to be moderated by peer justice climate perceptions.

The existence of a positive climate is expected to increase performance in teams where there are many members with high levels of teamwork competencies and is expected to diminish performance in teams where there are low levels of teamwork competencies. As the teamwork competency differential is not a direct indicator of the levels of teamwork competencies in a team, but instead an indication of how similar team member are to each other, there is likely to be some instances where a low teamwork competency differential is an indication of a team where all persons have a similarly low level of teamwork competency or all members have a similarly high level. In such a case, the effects of the peer justice climate are likely to cancel each other out. This proposed relation can be explained in the following manner.

H9 – Peer justice climate will moderate the relation between the teamwork competency differential and team performance, such that a more positive peer justice climate will lead to better team performance.

Shared leadership and teamwork competencies at the group level are expected to share a connection based on the observation of behaviours. This means that for there to be a high level of shared leadership, there should also be a large number of behaviours that are based on teamwork competencies.

Alternatively, if the group has an overall low level of teamwork competencies, then shared leadership will be low as no shared leadership behaviours are being expressed.

These high or low levels of shared leadership are therefore expected to relate directly to a team's competency differential. The differential, represents how similar or differently members are in terms of their teamwork competencies. When a team has a high teamwork competency differential, it is expected that team members differ significantly, whilst a low teamwork competency differential should indicate a minimal difference between team members. Taken in tandem with our the close link between shared leadership and the behaviours that come from teamwork competencies, the relation between the teamwork competency differential and team performance is expected to be moderated by shared leadership.

The existence of a high levels of shared leadership is expected to increase performance in teams where there are many members with high levels of teamwork competencies and is expected to diminish performance in teams where there are low levels of teamwork competencies. As the teamwork competency differential is not a direct indicator of the levels of teamwork competencies in a team, but instead an indication of how similar team member are to each other, there is likely to be some instances where a low teamwork competency differential is an indication of a team where all persons have a similarly low level of teamwork competency or all members have a similarly high level. In such a case, the effects of shared leadership are likely to cancel each other out. This case is quite complicated and may be best suited to an entirely different study, however, there is still enough information to consider that shared leadership may influence the expected relation between the teamwork competency differential and team performance. The following hypothesis will, therefore, be explored.

H10 – Shared leadership will moderate the relation between the teamwork competency differential and team performance, such that a higher levels of shared leadership will lead to better team performance.

Methods

Participants

The main study was carried out in the Department of Computer Science, Mathematics and Technology of one of the island's major universities. Participants were second and third year undergraduate students carrying out groups projects in the Computer Science programme. The requisite for participation was that students should be participating in the department's project based course which required students to work in teams for up to eight weeks. Students were also required to be between the ages of 18 and 35 with full-time status. The project included the submission of an individual project at the middle of the semester and a group project at the end of the course. Participants were informed about the details of the study and participation was voluntary. A total of 35 groups of three to five students agreed to participate, however only 29 groups participated all the way through to the end. The remaining six groups were not included in the final data set as the participating group members did not provide adequate data by completing all questionnaires. Participant ages ranged from 18 to 33 years old (M = 23.30, SD = 3.31). Eighty-one per cent of the students were male.

In the main study, participant's racial distribution was less diverse than the sample from the previous study, having: 46% Africans, 42% Mixed Race, and 8% East-Indian. The remaining two percent identified their race as 'Other'. The work experience of the students in this sample also varied greatly with students having as little as no experience to as much as 16 years (M = 2.70, SD = 3.20); the majority of students (39 per cent) had less than one year of work experience, with the second largest number of students (16 per cent) having up to three years of experience working. Student demographic data is shown in Table 15.

Table 15: Age, Work Experience and G.P.A. for participants in the main study.

	n	*Mean ($\bar{x}$)*	*Standard Deviation (σ)*
Age	104	23.30	3.31
Work Experience	104	2.70	3.20
GPA	97	3.12	.41

Measures

The main study was comprised of three separate questionnaires, each containing its own measures. The first questionnaire was comprised of demographic information and the TWCT. The second questionnaire consisted of the Measure of Peer Justice Climate and the Team Environment Measure. The third questionnaire consisted of the Shared Leadership questionnaire. Details related to each of the measures are outlined in the following sections.

Shared leadership was measured using a social network theory approach (D'Innocenzo, Kukenberger, & Mathieu, 2014) which was applied similarly to the way it was used by Carson et al. (2007). Social network theory approach required team members to indicate the degree to which the team relied on each of the other members for leadership (on a scale of one to five). A sample item is: "*To what degree does your team rely on [name of team member] for leadership?*" Next the density of valued network ties was calculated as a surrogate measure for shared leadership, by summing all team members' ratings of each other's leadership and then dividing their sum by the total number of possible ties among team members (Serban & Roberts, 2016; 186). The Social network analysis is considered to be especially well suited to the study of shared leadership because it is an inherently relational approach that allows for the possibility that there can be multiple leaders within a group (Mehra, Smith, Dixon & Robertson, 2006). This widely supported method relies on an individual's perception of leadership, in that persons report on leader effectiveness as they perceive it (Kozlowski & Ilgen, 2006).

The measure of *Internal Team Environment* from Carson and others (2007) was used to compliment the measure of shared leadership as it has been found to consistently predict the presence of shared leadership in teams. This measure consists of ten questions that assess the three sub-dimensions considered to make up team environment; shared purpose, social support, and voice. Participants used a Likert scale (1 = strongly disagree; 5 = strongly agree) to respond to questions such as: *People in this team are encouraged to speak up to test assumptions about issues under discussion.*

In the main study, student performance was provided by the professor for the course and was based on a predetermined rubric. Performance was assessed at two times throughout the period of the course. In the first instance, students were required to prepare an assignment to be submitted for assessment of individual performance and in the second instance student teams were required to present a team project for assessment for team performance. In the case of the individual assignment, each student was required to present a write up of their own evaluation of the problem and how it could be solved using the tools made available to them within the course. This assignment was an evaluation of students' competence in knowledge and written communications. On the other hand, the team assignment, required each member to contribute their work to an overall project to be presented together as a solution to the challenge issued to each team. The evaluation of performance at the team level was awarded based on each team's demonstration of planning, task coordination and verbal communication.

Table 16. List of Measures in main study. [a]

Variable	*Measure*	*No. of Items*	*IMOI classification*
Peer Justice Climate	Measure of Peer Justice Climate (Li, Cropanzano & Benson, 2007).	14	Emergent state
Internal Team Environment	Measure for assessing Internal Team Environment for Shared Leadership (Carson et al., 2007)	10	Emergent state
Shared Leadership	Measure for Shared Leadership (Carson et al., 2007)	G* – 1	Emergent state
Teamwork Competencies	TWCT (David Aguado et al., 2014)	36	Input
Performance	Knowledge and Communication Planning and Task Coordination (reported by supervisor)		Output

[a] – The following variables are not listed as they will be calculated using the same measures as listed above: individual leadership perceptions, and individual peer justice perceptions and teamwork competency differential at the individual and group level.

*(G = number of group members)

Levels of measurement

Measurement is an important factor to consider when measuring group level variables and this study seeks to observe and compare variables at the individual level as well as at the team level. Kozlowski (2013) highlights the importance of understanding constructs at different levels by explaining how individuals, teams and organizations are all a part of a multilevel system. The idea is

that the behaviours that are measured are exhibited by individuals, not teams. However, when various individuals behave together, team level phenomena can be observed. Teams in turn, are nested within organizations and as such team level phenomena can be observed as having organization wide effects and implications.

Chan (1998) described five composition models for calculating an upper level construct (e.g. team justice), based on data collected about a lower level construct (e.g. individual justice perceptions). These five models were: 1) Process composition model; 2) Additive model (e.g. Bliese, Chan, & Ployhart, 2008); 3) Direct-consensus model (e.g., Liao & Rupp, 2005); 4) Referent-shift model (e.g., Naumann & Bennett, 2000, 2002; Yang, Mossholder, & Peng, 2007); and 5) Dispersion model (e.g., Naumann & Bennett, 2000; Roberson, 2006a). Each of these composition models carry with them benefits (e.g. convenience) as well as drawbacks (e.g. applicability). They do however, provide a means of ensuring that variables can be more accurately compared at the individual and teams levels. Table 17 summarizes the descriptions and methods of aggregation for each of the five composition models proposed by Chan (1998). The Peer Justice Climate Questionnaire and the Measure of Internal Team Environment utilize the *referent-shift consensus model*. Both of these questionnaires require the individual, to give their own score to a group level construct which are then aggregated based on the agreement of the group members. The teamwork competency differential uses a *dispersion model* for as group level scores depend on the variance between scores at the individual level.

Table 17. A Typology of composition models (Chan, 1998).

Functional relationships	Typical operational combination
Additive Model	
Higher level unit is a summation of the lower level units regardless of the variance among these units	Summing or averaging lower level scores
Direct consensus model	
Meaning of higher level construct is in the consensus among lower level units	Within-group agreement to index consensus and justify aggregation
Referent-shift consensus model	
Lower level units being composed by consensus are conceptually distinct though derived from the original individual-level units	Within-group agreement of new referent lower level units to index consensus and justify aggregation
Dispersion Model	
Meaning of higher level construct is in the dispersion or variance among lower level units	Within-group variance (or its derivative) as operationalization of the higher level construct
Process model	
Process parameters at higher level are analogues of process parameters at lower level	No simple algorithm; ensure analogues exist for all critical parameters

Procedure

The main study was larger and required the submission of official requests for extensive data collection from students throughout the semester. Permission was sought and granted by the Research Ethics committee of the University of the Southern Caribbean as well as the Vice-Director responsible for research matters. The objectives of the study were outlined to these authorities, with emphasis placed on the potential ethical concerns and the efforts proposed to avoid them (see Appendix I). The Department of Computer Science, Mathematics and Technology was considered a good fit for the proposed research due to three supportive factors: the structure of the courses, the teaching methodology used and the willingness of the Head of the Department to participate. The structure of the courses in the department of Computer Science programme was considered suitable as the Software Engineering Group Project required team collaboration from start to completion. The teaching methodology of this course was particularly suitable as it divided the course material into two semesters. The first semester covered all the teaching material in the traditional format and in the second semester students were expected to use the material learnt during the first semester to carry out a group project. Data would therefore be collected during the second semester. Also, the team project followed a set structure with clear objectives for student's outputs, which could be evaluated using a straightforward rubric prepared for the course by its professor. One other essential element was that the course evaluated student performance based on their performance both as an individual and as a team. Above all, the support from the Head of the Department was also a critical part of data collection as measuring student performance required access to student grades and the rubric for awarding points for student individual and team performance.

The main objective of the Software Engineering Course were to facilitate experience in managing, planning and controlling software projects through application implementation. The doctoral student met with the Head of Departments and explained the method to be used for collecting data. The first class of the second semester of the course was used to organize students into teams. The Head of Department randomly placed students into teams of three to six. No team leaders were appointed

however an instruction was given to appoint a team representative to communicate with the professor on behalf of the team. Three main roles were available for students within each team, however, these roles were not assigned by the professor. Students could decide among themselves to be responsible for: design, coding, documentation or a combination of all three. In this way students could arrange themselves freely within teams by deciding whether to have specialized roles or to have all students share in the three available roles. This approach was chosen by the Head of Department as a means of re-creating the real life nature of software development teams where professionals would have to decide for themselves how they arranged their roles and duties.

All students were invited to participate in a meeting at the beginning of the semester. At this meeting, potential participants were briefed on the details of the research project and the contact details of interested groups were collected to arrange for data collection. Data was collected at two points during the semester, these were designated as: *time 1* and *time 2*.

Data collection at *time 1* occurred during the fourth week of the semester. This point was selected as it allowed students some time to get acquainted with their teammates and to allow the group to settle into a routine of regular meeting times. For *time 1*, participants were given two questionnaires, the first contained demographic questions (5 items) as well as the Teamwork Competency Test - TWCT (36 items). The second questionnaire from *time 1* contained the measure of internal team environment (10 items) and the measure of team justice perceptions (15 items). The same procedure from *time 1* was repeated eight weeks later at *time 2* except in this instance; another questionnaire was added with the measure for shared leadership (between 2 and 4 questions depending on group size). Thus *time 1* consisted of two questionnaires and *time 2* consisted of three. At the midpoint of the semester (week 6), which coincided with the second week after the data for *time 1* was collected, students were required to submit an individual assignment related to the project.

All questionnaires were distributed via the same online method, with students being contacted via email and asked to complete the questionnaires within one week of receiving them. Reminders were sent to students via email and text message, one week after the questionnaires were initially distributed

(for *time 1* and *time 2*), to encourage students to complete them. Students were allowed to complete the extensive questionnaires over various sessions, however, it was observed that most participants chose to complete all questionnaires during one or two sessions. Performance scores were collected from the Head of Department at the end of the semester. Figure 6 shows a timeline of data collection for ease of reference.

A total of 46 teams containing 130 full-time undergraduate students volunteered to participate at the start of the semester with team sizes ranging from three to six members (M = 3.45; SD = 1.15). At the end of data collection, only 29 teams containing 104 participants responded to all questionnaires, the response rate was therefore 77%. All of the teams completing data collection had at least three members (Table 18). Though the response rate achieved was higher than the typical rate for organization samples (52.7%, Baruch & Holtom, 2008), it can be considered to be relatively low for a student sample which can range in the nineties.

Figure 6. Timeline of data-collection.

Semester Start (week 1)	Time 1 (week 4)	Mid Semester (week 6)	Time 2 (week 12)	Semester End (week 14)
Groups formed	Questionnaire 1 - Demographic Questionnaire - TWCT Questionnaire 2 - Measure of Internal team environment - PJCQ	Submission of Individual Assignment	Questionnaire 1 - Demographic Questionnaire - TWCT Questionnaire 2 - Measure of Internal team environment - PJCQ Questionnaire 3 - Measure of Shared Leadership	Submission of Group Assignment Performance data collected

Table 18. Frequencies of team sizes in study.

No. of team members	Frequency	Percentage (%)
3	19	65.5
4	4	13.8
5	4	13.8
6	2	6.9
Total	29	100

Data analysis

Descriptive statistics such as; frequencies, mean, standard deviation, skewness and kurtosis were used to summarize the overall trends in the data. Correlational analyses were used to investigate the relation between the variables from Model 1. The comparisons of data from times one and two were done using paired samples *t*-test. Data aggregation was necessary to carry out team level analyses, as such, the within-group inter-rater agreement index ($r_{wg(j)}$), the intra-class coefficient (ICC[1]), and the group mean reliability (ICC[2]) were used to determine if there was sufficient within team agreement for team level analyses. To test for moderation in model 2, hierarchical multiple regression analysis were used. Analyses were carried out using the Statistical Package for the Social Sciences (SPSS) version 25; and the Process Model plug-in, developed by Hayes (2013) was used for running moderation models.

Results

Variable change over time

The TWCT will be reported here first as this is the main input variable to be observed. Descriptive statistics, including intercorrelations and alpha levels for participant's overall TWCT scores and the five underlying competencies are shown in Table 19. Since, data were collected both at an early stage in each team's development (*time 1*) and then near to the end of the team's project (*time 2*), analyses were done to investigate if there were any meaningful changes in variables over time. Participant's overall TWCT scores showed no change between *time 1* (M = 106.12; SD = 10.63) and *time 2* (M = 107.55; SD = 11.21) when compared using a paired samples *t*-test. Using the same type of *t*-test, the combined interpersonal competencies also did not show any difference between *time 1* (M = 67.55; SD = 7.10) and *time 2* (M = 68.32; SD = 7.24). Likewise, combined self-management competencies showed no difference between *time 1* (M = 38.56; SD = 4.62) and *time 2* (M = 39.23; SD = 4.90). Scores for the five corresponding competencies at *times 1* and *2* were also compared using paired samples *t*-tests. Results indicated that there were no significant changes in three of the five competencies (conflict resolution, collaborative problem solving and planning and task coordination). There was a significant difference in the scores for communication (M = 30.87, SD = 3.40) at *time 1* and communication (M = 31.60, SD = 3.79) at *time 2*; t (93) = -2.53, $p < .05$. Goal setting and performance management scores (M = 19.13, SD = 3.42) at *time 1* also showed a significant difference to goal setting and performance management scores (M = 19,79, SD = 3.42) at *time 2*; t (93) = -2.33, $p < .05$. Participant knowledge, skill and abilities. for the competencies of communication and goal setting and performance management showed a significant increase during the 8 weeks they worked together in teams.

Table 19. Descriptive Statistics and inter-correlations for TWCT and competencies

Time 1

Variable	*M*	*SD*	*α*	*1*	*2*	*3*	*4*	*5*	*6*	*7*
1. TWCT Total	106.12	10.63	.87							
2. Interpersonal KSAs	67.55	7.10	.80	.94**						
3. Self-Management KSAs	38.56	4.62	.79	.85**	.60**					
4. Conflict Resolution	23.27	3.34	.71	.78**	.85**	.49**				
5. Collab. Prob. Solv.	13.40	2.14	.42	.59**	.62**	.39**	.34**			
6. Communication	30.87	3.40	.69	.80**	.85**	.52**	.56**	.33**		
7. Goal Set. & Perf. Mgmt.	19.13	3.42	.76	.73**	.48**	.91**	.34**	.40**	.41**	
8. Plan & Task Coordination	19.44	2.18	.66	.73**	.57**	.78**	.53**	.24*	.50**	.45**
Time 2										
1. TWCT Total	107.55	11.21	.90							
2. Interpersonal KSAs	68.32	7.24	.85	.95**						
3. Self-Management KSAs	39.23	4.90	.82	.89**	.71**					
4. Conflict Resolution	23.11	3.04	.76	.83**	.89**	.59**				
5. Collab. Prob. Solv.	13.62	1.98	.37	.55**	.59**	.39**	.35**			
6. Communication	31.60	3.79	.80	.89**	.39**	.69**	.71**	.35**		
7. Goal Set. & Perf. Mgmt.	19.79	3.42	.80	.77**	.69**	.91**	.51**	.37**	.51**	
8. Plan & Task Coordination	19.45	2.26	.73	.74**	.91**	.76**	.48**	.27**	.70**	.42**

$N = 104$; ***$p < .001$, **$p < .01$, *$p < .05$; *Time 2* occurs 8 weeks after *Time 1*.

Individual scores on perceived levels of peer justice were also analyzed for change over time. Descriptive statistics, including intercorrelations and alpha levels for participant's overall peer justice perceptions and it's three sub dimensions are shown in Table 20. The intercorrelations and alpha levels were stable from one condition to another, however, there were some noticeable decreases in the alpha levels of the measures for the subdimensions. Cronbach's alpha for the overall peer justice climate measure remained exactly at .76 however the alpha level of the sub measure for procedural peer justice climate was reduced from .63 to .57, whilst the alpha level for interactional peer justice climate was reduced from .60 to .52. When compared using a paired samples *t*-test peer justice climate scores did not show any significant change between *time 1* and *2*.

Internal Team Environment, though not included in the model of this thesis, was measured for its ability to act as a reliable indicator for the presence of shared leadership (Carson et al., 2007). The measure for internal teamwork environment is an amalgamation of three separate yet highly correlated measures: 1) shared purpose, 2) social support, and 3) voice. Descriptive statistics, including intercorrelations and alpha levels for participant's scores on teamwork environment and its component measures are shown in Table 21. In this case, Cronbach's alpha is relatively stable between *time 1* (α = .89) and *time 2* (α = .86). With respect to intercorrelations, all intercorrelations decreased over the eight-week period of the study. When scores at *time 1* were compared with scores at *time 2*, there was no significant change of internal team environment.

Table 20. Descriptive Statistics and inter-correlations for Peer Justice Climate (PJC)[a] and sub-dimensions.

Time 1						
Variable	*M*	*SD*	α	1	2	3
1. Overall peer justice	34.33	4.66	.76			
2. Distributive peer justice	10.21	2.85	.89	.86**		
3. Procedural peer justice	11.85	1.53	.63	.64**	.42**	
4. Interactional peer justice	12.27	1.97	.60	.63**	.26**	.13
Time 2						
1. Overall peer justice	34.32	4.60	.76			
2. Distributive peer justice	9.86	3.05	.90	.85**		
3. Procedural peer justice	12.13	1.25	.57	.67**	.36**	
4. Interactional peer justice	12.33	1.79	.52	.66**	.23*	.41**

[a] – The Peer Justice Measure used is a revised version as indicated in *preliminary study*

***$p < .001$, **$p < .01$, *$p < .05$

Participant perceptions of shared leadership in their respective teams were calculated. This was done by determining the average value of leadership perceived by each team member for their respective teams. Scores on individual perception of leadership behaviours (shared leadership at the individual level) ranged from 1.33 to 5 and the mean score was 3.32 (*SD* = 1.02). It is important to bear in mind that, in theory, this variable is not the same as shared leadership but is only a proxy for it at the individual level. No analyses were done to compare a change in the levels of individual perceptions of shared leadership as this data was only collected at the end of the semester.

Table 21. Descriptive Statistics and inter-correlations for Internal Team Environment and sub-measures.

Time 1						
Variable	*M*	*SD*	*α*	1	2	3
1. Internal Team Environment	40.28	4.80	.89			
2. Shared Purpose	11.93	1.91	.81	.84**		
3. Social Support	11.80	1.93	.84	.88**	.61**	
4. Voice	16.55	1.89	.81	.82**	.48**	.58**
Time 2						
1. Internal Team Environment	40.27	4.35	.86			
2. Shared Purpose	12.06	1.78	.85	.78**		
3. Social Support	11.81	1.81	.74	.82**	.46**	
4. Voice	16.40	1.91	.85	.79**	.37**	.49**

***$p < .001$, **$p < .01$, *$p < .05$

Individual level correlational and mediation analyses

The first part of the main study involved determining if individual leadership perceptions and peer justice perceptions were related to teamwork competencies. This involved a series of correlational analyses outlined next. The variables were tested to ensure that they met the assumptions for using correlation analyses, which they did.

As proposed with hypothesis *H5*, the two main categories of teamwork competencies and the underlying five teamwork competencies from *time 1* were correlated to individual perceptions of leadership. Individual perceptions of leadership were found to be unrelated to interpersonal and self-management competencies. There was also no relation between individual perceptions of shared leadership and any of the five underlying teamwork competencies when compared individually. The lack of relation between leadership perceptions and other variables meant that no support could be found for hypothesis *H10*.

Hypothesis *H6* was then tested by carrying out correlational analyses between the teamwork competencies from *time 1* and individual perceptions of peer justice climate along with its sub dimensions from *time 2*. The results showed that the competencies categorized as interpersonal competencies (r (95) = .25, $p < .05$) as well as those categorized as self-management competencies (r (95) = .23, $p < .05$) were positively related to individual levels of peer justice. These results showed that the higher the levels of teamwork competencies exhibited by participants, the more likely they were to have more positive peer justice perceptions. The correlations between the underlying five teamwork competencies and sub-dimensions of individual peer justice perceptions produced a range of positive correlations. Table 22 shows the range of correlations between teamwork competencies and individual perceptions of peer justice. The teamwork competency responsible for conflict resolution was positively correlated with the procedural peer justice sub-dimension, r (95) = .28, $p < .05$. The teamwork competency responsible for communication was also positively correlated with the procedural peer justice sub-dimension, r (95) = .35, $p < .01$. Finally, the teamwork competency responsible for planning and task coordination was positively correlated to both the procedural peer justice sub-dimension, r (95) = .29, $p < .01$; and the interactional peer justice sub-dimension, r (95) = .30, $p < .01$. These various

positive relations showed that participants with higher levels of these teamwork competencies all experienced more positive justice perceptions of their peers. The other two competencies, collaborative problem solving and goal setting and performance management, did not show any significant relation to individual perceptions of peer justice.

To test hypotheses *H7;* participant's scores for interpersonal and self-management competencies and their five underlying teamwork competencies KSAs from *time 1* were correlated with individual performance. Results showed that there was a negative correlation between individual performance and the interpersonal competencies (r (98) = -.23, $p < .05$) as well as the self-management competencies (r (98) = -.22, $p < .05$). Therefore, students which demonstrated higher levels of teamwork competencies produced lower individual scores. Three of the underlying five teamwork competencies were responsible for this relation as they showed the following correlations: conflict resolution, r (98) = -.21, $p < .05$; collaborative problem solving, r (98) = -.27, $p < .05$; and goal setting and performance management, r (98) = -.22, $p < .05$. These correlations consistently demonstrated that students with higher levels of teamwork competencies performed worse. The interpersonal and self-management competencies including all of the underlying five teamwork competencies showed no significant relation to performance at the group level.

Table 22. Correlations between Teamwork competencies and sub-dimensions of Individual Peer Justice Perceptions.

	Individual Peer Justice			
	Distributive	Procedural	Interactional	Overall
Conflict Resolution	.15	**.28****	.15	**.23***
Collab. Prob. Solv.	-.01	.09	.03	.03
Communication	.16	**.35****	.18	**.26***
Goal Set. & Perf. Mgmt.	.11	.06	.07	.12
Plan & Task Coordination	.20	**.29****	**.30****	**.32****
Interpersonal KSAs	.15	**.34****	.17	**.25***
Self-Management KSAs	.17	.18	.19	**.23***
Total TWCT	.17	**.30****	.20	**.26****

N = 104; ***$p < .001$, **$p < .01$, *$p < .05$

Data aggregation

Before hypotheses could be tested for variables at the group level, data must be evaluated to determine that responses collected from each individual in a team is suitable to be aggregated with the scores of other individuals of that team to form a group level score. It is expected that there must be a reasonable amount of agreement among team members also known as within team agreement. Within team agreement for data of this nature has been determined using the within-group inter-rater agreement index ($r_{wg(j)}$), the intra-class coefficient (ICC[1]), and the group mean reliability (ICC[2]). These methods for determining within team agreement produce a value within the range of 0 and 1 and. For ICC(1) a small value suggests that there is considerable variability within each team whereas a large value suggests that there is some sort of cluster within the team. The reliability of group mean scores is determined by the value of ICC(2); a high value suggests that the group means are reliable, whereas a low value suggests the opposite (Bliese, 1998). In the case of the $r_{wg(j)}$, average scores should be equal to or greater than .70 to be considered appropriate for aggregation to the unit level.

The agreement across the respondents' ratings of their team members on leadership was assessed using the within-group interrater agreement index (*Median* $r_{wg(j)}$ = .67), the intra-class coefficient (ICC[1] = .43), and the group mean reliability (ICC[2] = .79). Internal team environment, the expected counterpart to shared leadership, was then assessed for its suitability for aggregation to the team level. As internal team environment is actually comprised of three complimentary dimensions (shared purpose, social support, and voice), the within-group interrater agreement of these were also separately assessed. The mean $r_{wg(j)}$ values for scores for at *time 1* were: overall internal team environment, .85, shared purpose, .73, social support, .86 and voice, .89. Corresponding scores for *time 2* were: overall internal team environment, .86, shared purpose, .84, social support, .73 and voice, .90. At *time 1* the intra-class coefficients ICC(1) and ICC(2) produced these results: overall internal team environment, .42 and .88; shared purpose, .58 and .81; social support, .63 and .84; voice .50 and .80. Results at *time 2* were very similar: overall internal team environment, .37 and .85; shared purpose, .65 and .85; social support, .48 and .73; voice .58 and .85. At both times, the agreement across the respondents' ratings were acceptable for aggregation to the group level.

Table 23. Within team agreement for data for all relevant variables.

	$r_{wg(j)}$*	ICC 1	ICC2
Time 1			
Peer Justice Climate	.75	.23	.73
Distributive	.62	.72	.89
Procedural	.85	.35	.62
Interactional	.68	.32	.58
Internal Team Environment	.85	.42	.88
Shared Purpose	.73	.58	81
Social Support	.86	.63	.84
Voice	.89	.50	.80
Time 2			
Peer Justice Climate	.78	.21	.71
Distributive	.63	.73	.89
Procedural	.91	.28	.54
Interactional	.67	.25	.50
Internal Team Environment	.86	.37	.85
Shared Purpose	.84	.65	.85
Social Support	.73	.48	.73
Voice	.90	.58	.85
Shared Leadership	.67**	.43	.79

* Mean $r_{wg(j)}$ scores

** Median $r_{wg(j)}$ score preferred as measure of central tendency

Peer justice climate scores were next assessed for suitability for aggregation to the group level. The *time 1* mean $r_{wg(j)}$ value for the overall peer justice climate measure was an acceptable .75 with the sub-dimensions having the following values: distributive peer justice climate, .62; procedural peer just climate, .85; and interactional peer justice climate, .68. The mean $r_{wg(j)}$ values at *time 2* were similar with: overall peer justice climate at .78, distributive peer justice climate at .63; procedural peer justice climate at .91; and interactional peer justice climate at .67. Intra-class coefficients were then calculated. The ICC(1) and ICC(2) for the peer justice climate measures at *time 1* were: overall climate, .23 and .73 distributive peer justice climate, .72 and .89; procedural peer jus- tice climate, .35 and .62; and interactional peer justice climate, .32 and .58. The ICC(1) and ICC(2) at *time 2* were slightly lower yet still acceptable with the following scores: overall climate, .21 and .71 distributive peer justice climate, .73 and .89; procedural peer justice climate, .28 and .54; and interactional peer justice climate, .25 and .50. The data for peer justice climate perceptions at *time 2* was preferred for further analyses as it represented the team's perceptions after having worked together. The results for the measures of peer justice climate demonstrated acceptable levels for the aggregation of data. Within team agreement for data for all variables can be found in Table 23.

Group level correlational and moderation analyses

Overall peer justice climate scores (M = 34.13, SD = 3.29) ranged from 29 to 39.5 and the related sub-dimensions were: distributive peer justice climate (M = 9.73, SD = 2.24), procedural peer justice climate (M = 12.11, SD = .78) and interactional peer justice climate (M = 12.29, SD = 1.25). The teamwork competency differential was also calculated finding the intrateam variation of teamwork competencies, or internal standard deviation for teamwork competency scores. Teamwork competency differential values (M = 7.23; SD = 3.74) ranged from 0 to 15.8 (a zero minimum as these are based on values for standard deviation). Average differential scores for interpersonal teamwork competencies were 4.84 (SD = 2.95); whilst average scores for self-management competencies were 2.92 (SD = 1.92);. Further, the differential values for the five corresponding teamwork KSAs were also calculated as

follows: conflict resolution (*M* = 2.07; *SD* = 1.36); collaborative problem solving (*M* = 1.62; *SD* = .80); communication (*M* = 2.64; *SD* = 1.22); goal setting and performance management (*M* = 2.08; *SD* = 1.41); and planning and task coordination (*M* = 1.50; *SD* = .65). Table 24 shows the descriptive statistics for the various teamwork competency differentials calculated for use in analyses at the group level.

Group level scores for internal team environment and it's component variables were: overall internal team environment, *M* = 40.08, *SD* = 2.70; shared purpose, *M* = 11.99, *SD* = 1.23: social support, *M* = 11.79, *SD* = 1.08; and voice, *M* = 16.30, *SD* = .95. Next, shared leadership density was calculated for each team following the method used by Sparrowe and colleagues (2001). Shared leadership density (*M* = 1.52, *SD* = .41, *Median* = 1.43) ranged from 1.10 – 2.60 and is considered to be a measure of the total amount of leadership displayed by team members as perceived by others on the team. To determine if the values for shared leadership were representative of a strong, medium or weak example of shared leadership, the scores for shared leadership were correlated with group scores of internal team environment. Results showed that there was no significant relation between the two variables. Internal team environment was not related to shared leadership whatsoever. These results were contrary to what was expected as various examples throughout the literature demonstrate a relation between internal team environment and shared leadership (Sparrowe et al., 2001). Thus, the results were interpreted to mean that shared leadership was not developed to a sufficiently detectable level.

Table 24: Descriptive statistics for group level variables in the main study.

	n	*Min - Max*	*M*	*SD*	Asymmetry	Kurtosis
Total Teamwork Competency Diff.	28		7.23	3.74	.38	.37
Interpersonal KSAs Diff.	28		4.84	2.95	.36	-.53
Self-Management KSAs Diff.	28		2.92	1.82	.35	-.60
Conflict Resolution Differential	28		2.07	1.36	.68	-.52
Collab. Prob. Solv. Differential	28		1.62	.80	.43	.57
Communication Differential	28		2.64	1.22	-.15	.76
Goal Set. & Perf. Mgmt. Differential	28		2.08	1.41	.68	-.71
Plan & Task Coordination Diff.	28		1.50	.65	-.49	-.67
*Peer Justice Climate**	29	9 – 45	34.23	3.29	.13	-1.14
Distributive	29	3 – 15	9.73	2.24	-.17	-1.23
Procedural	29	3 – 15	12.11	.78	-.10	-.47
Interactional	29	3 – 15	12.29	1.25	-.50	.17
Internal Team Environment	29	10 – 50	40.08	2.70	-.09	-.89
Shared Purpose	29	3 – 15	11.99	1.23	-.75	-.02
Social Support	29	3 – 15	11.79	1.09	-.02	-.87
Voice	29	4 – 20	16.30	.95	.38	-.17
Shared Leadership	29	0 – 5	1.52	.41	1.60	2.13
Team Performance	29	0 – 1.00	.77	.08	.13	-1.13

* Revised Peer Justice Climate Measure

The second part of the main study involved determining relations between the group level variables and exploring if shared leadership or peer justice climate are moderators of the expected relation between the teamwork competency differential and team performance. Hypothesis *H8* was tested by correlating the teamwork competency differential with team performance. The results showed that there was a positive correlation between the overall teamwork competency differential and team performance, r (29) = -.70, p < .01. Similar to the construct at the individual level, the teamwork competency differential was divided into the category of interpersonal competency differential and self-management competency differential. When compared with team performance, only the interpersonal teamwork competency differential category was related to team performance, r (28) = -.66, p < .01. These results showed that teams with a higher interpersonal teamwork competency differential performed more poorly. The differentials of the underlying five competencies were then correlated with team performance to determine if there was any in particular that was responsible for the relation. Results showed that the competency differential for conflict resolution (r (28) = -.54, p < .01) and communication (r (28) = -.55, p < .01) were negatively related to team performance. Both of these negative relations show that teams with higher competency differentials for conflict resolution and communication all performed more poorly.

Moderation analyses were used for investigating hypotheses *H9* and *H10*. First the software package *G*Power* was used to determine the best sample size for moderation analysis using three predictors (1. predictor, 2. moderator, 3. predictor*moderator). The suggested minimal sample size for analyses was determined to be 77 groups, an amount far beyond the number of groups available for analysis. Due to the small sample available, a heteroscedasticity consistent covariance matrix estimator (HCCME) was applied to correct or at least improve inferences in the presence of heteroscedasticity of unknown form due to a small sample size (Vynck, 2017; MacKinnon and White, 1985). The preferred HCCME was "HC3" a revision of the original HCCME (also known as HC0), that has been reported to be superior in terms of type I error rate control (Long & Ervin, 2000). Moderation analyses were carried out regardless, in an effort to investigate hypotheses *H9*.

A hierarchical multiple regression analysis was conducted to determine if there was a moderation of the relation between the overall teamwork competency differential and team performance

by peer justice climate. In the first step, two variables were included: peer justice climate and teamwork competency differential. These variables accounted for a significant amount of variance in team performance, R^2 = .490, $F(2, 26) = 12.42$, $p < .001$. Next, the interaction term between peer justice climate and teamwork competency differential was added to the regression model, however, it did not account for a significant proportion of the variance in team performance as the R^2 change was insignificant. Upon review it was found that the teamwork competency differential, $b = -.02$, $t(25) = -7.21$, $p < .01$, was the only significant predictor of team performance. For every unit increase of the teamwork competency differential (standard deviation), there was a .02 (two percent) decrease in participant grades.

Table 25: Intercorrelations of group level variables

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1. Teamwork Competency Differential													
2. Interpersonal KSA Differential	.90**												
3. Self-Management KSA Differential	.53**	.13											
4. Conflict Resolution Differential	.64**	.79**	-.02										
5. Collab. Prob. Solv. Differential	.55**	.58**	.17	.31									
6. Communication Differential	.68**	.77**	.06	.47**	.43**								
7. Goal Set. & Perf. Mgmt. Differential	.34	-.06	.82**	-.14	.10	.03							
8. Plan & Task Coordination Diff.	.23	.10	.44**	.14	.26	.14	.15						
9. Peer Justice Climate (PJC)	-.01	.12	-.15	.09	.03	.19	-.26	.16					
10. Distributive PJC	.13	.23	-.05	.16	-.03	.19	-.32	.21	.86**				
11. Procedural PJC	-.04	.09	-.24	.18	.28	.23	-.16	.07	.73**	.41**			
12. Interactional PJC	-.21	-.14	-.15	-.13	-.04	.03	-.03	.01	.65**	.21	.56**		
13. Shared Leadership	-.16	-.16	-.17	.06	-.15	-.07	.13	-.08	-.31	-.23	-.21	-.28	
14. Team Performance	-.70**	-.66**	-.31	-.54**	-.18	-.55**	-.19	-11	.08	-.10	.15	.28	-.02

$N = 104$; ***$p < .001$, **$p < .01$, *$p < .05$.

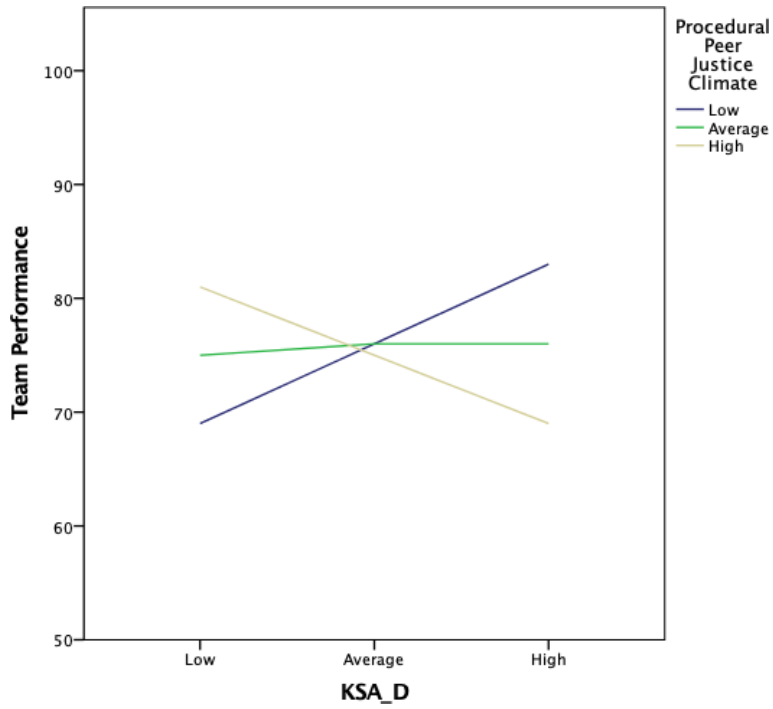
Follow up tests were carried out to see if there was moderation of the relation between the sub-dimensions of peer justice climate and team performance by the differentials of any of the five teamwork competencies. One combination showed significant results when analysed. The fairness for team procedures perceived by participants (procedural peer justice climate) was found to moderate the relation between the differential for goal setting and performance management and team performance. The use of hierarchical multiple regression analysis on the centered variables found the overall model to be significant, $R^2 = .27$, $F(3, 24) = 5.14$, $p < .01$. There were no significant main effects as neither procedural peer justice climate nor the differential for goal setting and performance management was able to act as an individual predictor of team performance. There was, however, a significant interaction effect of the differential for goal setting and performance management and procedural peer justice perception, $b = -.06$, $t(24) = -2.73$, $p < .05$.

Simple slopes were used to probe the interaction effect by testing the conditional effects of the differential goal setting and performance management at three levels of procedural peer justice climate, one standard deviation below the mean, at the mean, and one standard deviation above the mean. For teams with an average level of the procedural peer justice climate there was no relation between the goal setting and performance management differential and team performance. Goal setting and performance management differential, $b = .002$, $t(24) = -.16$, $p = .87$ – for average levels of procedural peer justice climate. For teams with low levels of procedural peer justice climate, each unit of the goal setting and performance management differential increased grade by 5 percent. Goal setting and performance management differential, $b = .05$, $t(24) = 1.93$, $p < .10$ – for teams with a low level of procedural peer justice climate. For teams with high levels of procedural peer justice climate each unit of the goal setting and performance management differential decreased team grade by 4 percent. Goal setting and performance management differential, $b = -.04$, $t(24) = -3.48$, $p < .01$ – for teams with a high level of procedural peer justice climate.

When the score for procedural peer justice climate was a value between the minimum 10.55 and 11.16, $t(24) = 2.06$, $p = .05$, $b = .06$, the goal setting and performance management differential and team performance were related such that a larger differential in levels of the goal setting and performance management differential meant a better team performance. However, if the value of the

procedural peer justice climate increased beyond 11.16, then the effect was diminished causing the goal setting and performance management differential to have no effect on team performance. Also, when procedural peer justice climate perceptions increased further up until the value of 12.40 or beyond, $t(24)= -2.06$, $p = .05$, $b = -.02$, the goal setting and performance management differential and team performance were again related but this time in the opposite way, such that teams with lower differentials for goal setting and performance management experienced better performance.

Figure 7. Interaction effect of moderation of procedural peer justice climate on the relation between KSA_D and team performance.*



*KSA_D – Goal setting and performance management

In a similar fashion, hypothesis *H10* was tested via a hierarchical multiple regression analysis to determine if there was a moderation of the relation between the teamwork competency differential and team performance by shared leadership. In the first step, two variables were included: shared leadership and the overall teamwork competency differential. These variables accounted for a significant amount of variance in team performance, $R^2 = .501$, $F(2, 26) = 13.03$, $p < .001$. Next, the interaction term between peer justice climate and teamwork competency differential was added to the regression model, however, it did not account for a significant proportion of the variance in team performance as the R^2change was insignificant. Upon further investigation, it was again found that the teamwork competency differential was a significant predictor of team performance. Shared leadership was also found to separately predict team performance in a significant way, $b = -.03$, $t(25) = -2.47$, $p < .05$. For every unit increase of shared leadership (standard deviation), there was a .03 (three percent) decrease in participant grades.

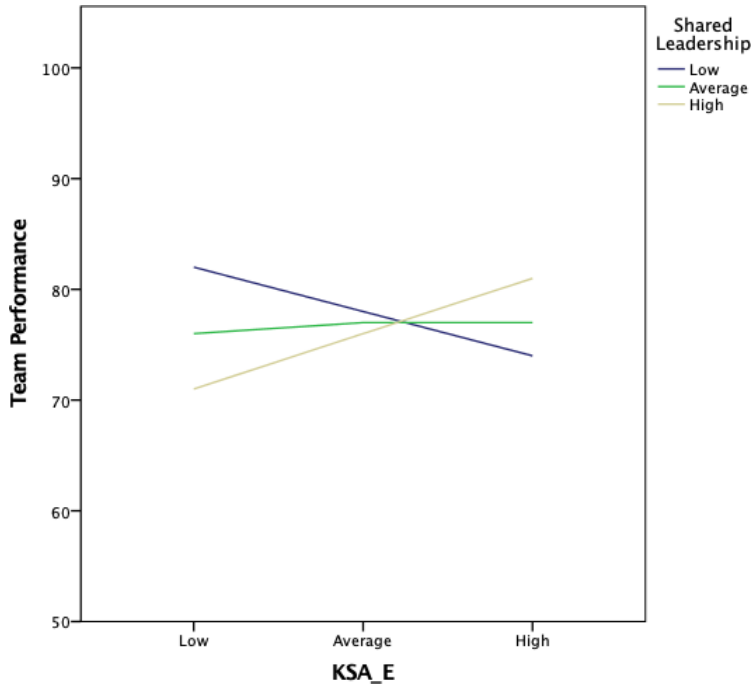
Follow up tests were carried out to see if there was moderation of the relations between the differentials of the five underlying teamwork KSAs and team performance by shared leadership. One combination showed significant results when analysed. Shared leadership was found to moderate the relation between the teamwork competency differential for planning and task coordination and team performance. The use of hierarchical multiple regression analysis on the centered variables found the overall model to be significant, $R^2 = .23$, $F(3, 24) = 8.52$, $p < .01$. There were, again, no main effects as shared leadership and the planning and task coordination differential were not significant predictors of team performance. There was, however, an interaction effect of shared leadership and the planning and task coordination differential, $b = .17$, $t(24) = 4.24$, $p < .01$.

Simple slopes were used to explore the interaction effect simulating what results would look like under low, average and high levels of the moderator variable. For average levels of shared leadership there was no relation between the planning and task coordination differential and team performance. Planning and task coordination differential, $b = -.01$, $t(24) = -.62$, $p = .54$ – for average levels of shared leadership. Alternatively, for low levels of shared leadership each unit of the planning and task coordination differential decreased grade by 8 percent. Planning and task coordination differential, $b = -.08$, $t(24) = -2.65$, $p < .05$ – for teams with a low level of shared leadership. In the case

of high levels of shared leadership each unit of the planning and task coordination differential increased team grade by 5 percent. Planning and task coordination differential, $b = .05$, $t(24) = 2.10$, $p < .05$ – for teams with a high level of shared leadership.

When the value of shared leadership was between the minimum 1.10 and the value 1.27, $t(24)= -2.06$, $p = .05$, $b = -.06$, the planning and task coordination differential and team performance were related such that as the planning and task coordination differential increased team performance decreased. However, if the value of shared leadership increased beyond 1.27, then the effect was diminished causing the planning and task coordination differential to have no effect on team performance. Also, when shared leadership increased further to a value of 1.92 and beyond, $t(24)= 2.06$, $p = .05$, $b = .05$, the planning and task coordination differential and team performance were again related, but this time in the opposite way, such that as the differential for planning and task coordination increased the team's performance also increased.

Figure 8. Interaction effect of moderation of shared leadership on the relation between KSA_E and team performance.*

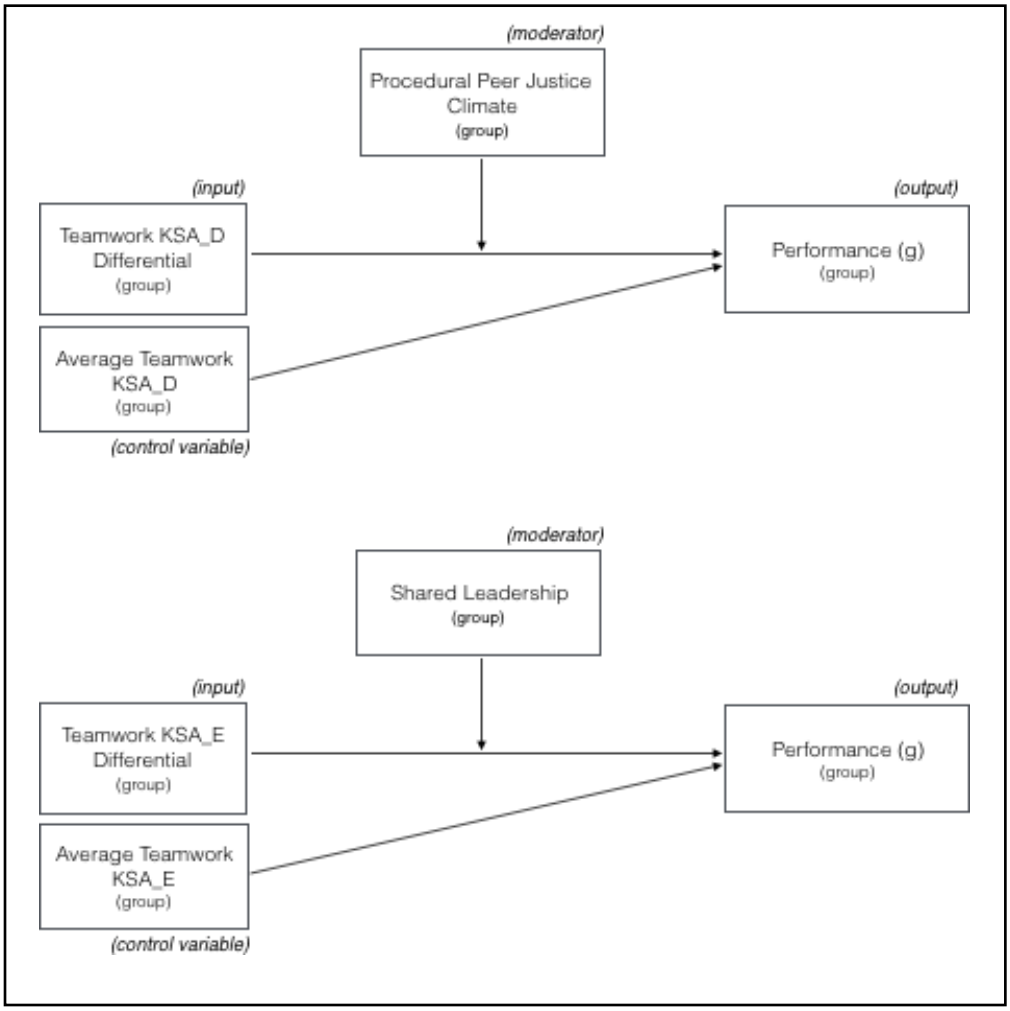


*KSA_E – Planning and task coordination

Post-hoc Analyses

The moderation analyses for Hypotheses *H9* and *H10* revealed significant interactions that required further investigation for more conclusive results. As explained, the teamwork competency differential represents the difference in levels of teamwork competencies among persons within the same team. A high teamwork competency differential indicates a situation where a group has a mix of persons with both high and low levels of teamwork competencies, however, a low differential means that all group members have similar levels of teamwork competencies weather these levels are low, medium or high. The ambiguity, which occurs when the teamwork competency differential is low poses a problem when interpreting the interaction of variables. For instance, in the case of the teamwork competency differential for goal setting and performance management, there were two trends. The first trend showed that when procedural peer justice climate was low, the differential for goal setting and performance management was related to team performance such that a larger differential meant better team performance. Alternatively, the other trend showed that the goal setting and performance management differential was related to team performance in the opposite way. This time the teams with lower differentials for goal setting and performance management experienced better performance. In the case of the second trend, a lower differential can mean that all team members had either low, average or high teamwork competency scores. To further investigate the effect of a low teamwork competency differential on team performance post-hoc analyses were carried out. These analyses included the average level of teamwork competencies for each team as a control variable for the teamwork competency differential. Figure 9 illustrates a revision of the original model which includes the control variables.

Figure 9. Updated models of study



The average teamwork competency score for each team was expected to account for some of the variance caused within the models proposed. First, the average score on the goal setting and performance management competency for each team (M = 19.07; SD = 2.16) was added to the overall model for the moderation of the relation between the goal setting and performance management differential and performance by procedural peer justice climate. Results for the overall model were found to be significant, R^2 = .27, $F(4, 23) = 3.73$, $p < .05$. However, there continued to be no main effects as none of the variables were able to individually predict team performance significantly. As before, only the addition of the interaction resulted in a significant change to the model, ΔR^2 = .23. The

interaction effect of the goal setting and performance management differential and procedural peer justice perception remained the same as before, b = -.06, $t(23)$ = -2.74, $p < .05$.

Similarly, the average score on the planning and task coordination competency (M = 19.29; SD = 1.46) was added to the overall model for the moderation of the relation between the planning and task coordination differential and performance by shared leadership. Results for the overall model were found to be significant, R^2 = .26, $F(4, 23)$ = 6.47, $p < .05$. In this instance, there was also no main effect as none of the variables were able to individually predict team performance significantly. Again, the addition of the interaction resulted in a significant change to the model, ΔR^2 = .15. The interaction effect of the planning and task coordination differential and procedural peer justice perception was, b = .15, $t(23)$ = 2.92, $p < .05$. The consistency of these results emphasize the need for further investigation into the above findings via a more comprehensive follow-up study.

Discussion

Variable change over time

In the main study, the data collected at *time 2*, was similar to the data collected at *time 1* for most variables, however, two of the teamwork competencies (communication and goal setting and performance management) showed a significant increase over the eight week period between data collection. According to Boyatzis (2007), most competencies are unlikely to show any significant change over a short period of time. Thus, these changes, though small are an incredibly interesting finding. As no change was to be expected over a short period of time, no hypotheses were proposed for detecting changes in these variables. The undertaking of routine comparative analyses was the only reason for this discovery.

With respect to the improvement in communication; one possible reason for this is the increase in the amount of information sharing demanded by the guidelines of the Software Engineering group project. Information sharing has been found to contribute to improved communication skills within teams (Blum, Raemer, Carroll, Dufresne & Cooper, 2005). Sharing information among team members would have been necessary for various tasks such as: preparation of documentation, discussion of programming languages, revision of designs and preparation for submissions. When compared with the typical class setting for that university, there is a marked difference in the demand for communication. In a typical course students are not be required to share information, except during class discussions or with their professor in the form of assignments. Consistent interaction and discussion is likely to have been responsible for this change over such a relatively short time.

Other factors that may be linked to improved communication in a team setting can be gleaned from the types of knowledge, skills and abilities required to demonstrate the communication competency. The knowledge, skills and abilities related to communication include utilizing decentralized networks to enhance communication, communicating openly and supportively, using active listening techniques, recognizing and interpreting the non-verbal messages of others and engaging in ritual greetings and small talk (Aguado et al., 2014). Each of these KSAs may have been

improved in their own way over the lifespan of the team as team members engaged in these activities with each other.

Goal setting and performance management involves establishing specific, challenging, and accepting team goals (Stevens and Campion, 1994). Though it is not certain what exactly may be responsible for an increase in this competency, it is likely that the nature of the course would have played an important role. The Software Engineering project included various guidelines for completion that required students to manage their performance over the semester in ways they would not have had to for other courses. Furthermore, the establishment of team goals would have been clearly outlined in the course guidelines and reinforced by the course's professor. This consistent reinforcement of goals and the expected performance is likely to have developed student's abilities to manage and improve their goal setting and performance behaviours (Pereda Marín, Berrocal Berrocal & Garcia, 2001).

Despite the improvements to communication, goal setting and performance management in students, positive changes have been known to be short-lived. Known as a honeymoon effect, improvements gained from training can start with improvement immediately after the intervention, however, these improvements drop significantly some months after (Campbell et al., 1970). Future studies should consider including a follow-up survey six months later, to collect data related the longevity of improvements to competencies after training.

Shared Leadership and Internal Team Environment

Internal team environment is made up of three mutually reinforcing and complimentary dimensions: shared purpose, social support, and voice. The relation between internal team environment and shared leadership is an interesting one since a positive internal team environment isn't so much an antecedent factor for shared leadership as it is an indicator that the conditions are right for it to develop. In our study, Internal team environment was measured and found to be at reasonably high levels. The averages value for its dimensions were found to be well into the high side of the range. At the group level, shared purpose scores averaged at 11.99 (*SD* = 1.24) out of a maximum of 15; social support scores averaged at 11.79 (*SD* = 1.09) out of a maximum of 15, and voice scores averaged at 16.30 (*SD*

= .95) out of a maximum of 20. Despite these high scores – which reflect a positive internal team environment – shared leadership scores remained low at the group level with an average of 1.52 (*SD* = .41) out of a maximum score of 5 for the team. This average for team leadership is quite low and would be considered as non-existent when compared with other examples in the literature (Carlson et al 2007, used a cutoff point of 3). There is, therefore, some question as to why shared leadership did not develop in participating teams.

The disparity between the measured levels of internal team environment and shared leadership is indicative of the fact that shared leadership may not have develop due to reasons not related to the internal team environment. High levels of shared purpose indicate that team members possessed shared motivation and a willingness to carry out team responsibilities. The high levels of social support reflected that team members were available for each other emotionally and psychologically. And the high levels of voice indicated team members believed they had some input into the team's activities. The low levels of team leadership must, therefore, be linked to other factors.

Several reasons may be considered for the lack of shared leadership among teams. First, team members must be willing to offer leadership and to seek the direction of others. The students within participating teams may not have been willing to act in the role as leader; it is more likely that they expected their professor to act as a de-facto leader of the group as no one was formally selected. In a situation where the professor does not assume the role of leader, and there being no formal leader appointed, team leadership could have remained an area of ambiguity due to the lack of clear directives as to how the team is expected to operate in terms of leadership. Thus, team members may have been unwilling to either offer leadership or accept the direction of others as this was not the norm considered for the team.

The teams in this study operated within a structured environment that offered guidelines for various activities (communication, goal setting and performance) but did not offer any guidelines for leadership. Consider this, if a leader had been formally appointed, students would have some indication that the group abides by some leadership norms. Thus, students could then decide to follow their leader, and develop impressions as to whether or not the leader has carried out his or her role. Perhaps, other team members could volunteer to carry out leadership activities when the leader is absent or unableto.

In the situation where no leader is formally appointed, there is no basis for assuming a leadership role as no one is expected to act as a leader.

The existence of external coaching behaviours (Carson et al., 2007) and empowering leadership behaviours (Martin et al., 2013) are known to encourage the development of shared leadership in teams. This study gives the example of a situation where there were good conditions for leadership (i.e. a good internal team environment) and a lack of formal leadership, coaching or empowering leadership behaviours. One interpretation of the results could, therefore, be that external coaching or empowering leadership behaviours are necessary to set a precedent for shared leadership behaviours.

Bennet and colleagues (2003) indicated that shared leadership is the result of conjoint activity, as persons interact and depend on each other to carry out team related task. The structure of the teams was one based on each student selecting a role or responsibility from among these categories: design, coding and documentation or a combination of all three. This type of arrangement seems to be incompatible with the idea of team interdependence. A team member selecting either one of these roles is likely to involve themselves in tasks related to this role without much need or concern for interacting or depending on other team members, each of whom have unrelated tasks. Thus, the team structure seems to be an important factor in facilitating the development of shared leadership. Team structure that promotes specialized work does not permit for significant task interdependence and therefore may stifle the development of shared leadership despite other supportive factors (e.g. a healthy internal team environment).

Bivariate Correlations

Correlational analyses in this study provided a mixed of positive and negative results. Most importantly, however, is the fact that it has opened the doors for exploration of the idea of teamwork competencies as a more or less neutral predictor of various team level outcome variables. With respect to individual and team performance, there was a significant relationship between teamwork competencies and performance. Performance and team effectiveness are the most typical outcomes associated with teamwork competencies and therefore this relation was to be expected (Stevens and

Campion, 1994; Aguado et al., 2014; Cooke et al., 2003). In fact, it is this practice of associating teamwork competencies with performance that helped to inspire the hypotheses that explore the relation it may hold with other outcome variables such as peer justice climate and shared leadership.

The negative relation between teamwork competencies and performance at the individual level was a very surprising finding. When analysing variables at the individual and group levels, it is important to compare individual level variables with each other and group level variables with each other, however, a negative correlation between teamwork competencies and individual performance sparked a new curiosity. There was some question as to whether the teamwork competency scores would correlate positively with team level performance as it was meant to be related to the team's performance and not performance on individual level tasks. A post-hoc analysis was carried out to determine if there would be a significant correlation between teamwork competencies and team level scores. To facilitate this analysis, the team score was assigned to each respective team member allowing for the comparison to be made. The result, however, was that there was no significant correlation. This was unsurprising, as there were only 29 distinct values for team scores being compared with 104 scores, at the individual level; an arrangement that was likely to fail due to lack of variance in the performance scores and issues of homoscedasticity.

To revisit the negative relation between teamwork competencies and individual performance, the specific competencies responsible for the relation were: conflict resolution, collaborative problem solving and goal setting and performance management. Each of these shared a negative correlation meaning that as persons demonstrated higher levels of these teamwork competencies their scores would have been lower than those persons who demonstrated lower levels of these competencies.

The first of these, conflict resolution, involves: the ability to encourage desirable and discourage undesirable team conflict; the ability to implement appropriate conflict resolution strategies; and the ability to employ integrative strategies to resolve conflict instead of distributive ones. Next, collaborative problem solving involves: identifying situations requiring participative group problem solving, utilizing the proper degree of participation, recognizing obstacles to problem solving, and implementing appropriate corrective actions (Aguado et al. 2014). Finally, goal setting and performance evaluation involves: establishing specific team goals, evaluating team performance and providing

feedback on overall as well as individual team member performance. The consistent negative relations of these three competencies with team performance is the most useful element of these results. Had there been only one competency with a negative result and the others were positive, there may have been some question of data error or perhaps some other confound. However, the consistent negative correlation across competencies coupled with the prior literature to support that these competencies positively relate to team performance via the teamwork process suggest that some confidence may be given to the following inference. Teamwork competencies may have a negative effect on individual performance, when there are simultaneous individual and team objectives within a constrained time period.

In the setting of this investigation, teams were constrained by time to meet both the objective of an individual submission as well as that of a team submission. This means that at some point team related goals could have been at odds with personal ones. The idea that persons with higher levels of teamwork competencies were disadvantaged as it pertains to individual performance suggests that those team members more involved in the teamwork process, perhaps due to their higher level of teamwork competencies, were less concerned with their individual performance. Put another way, the persons with higher scores were the ones less likely to be involved in the teamwork process, perhaps because they prioritized their individual tasks above team objectives. This idea will require future investigation that deliberately seeks to determine if persons with higher levels of teamwork competencies are more likely to put team related objectives above personal ones.

Individual perceptions of leadership did not share a relation with teamwork competencies. These results must be interpreted while taking into account one important consideration about the measurement of leadership for this study. The measure of shared leadership used was not one designed for collecting data on individuals at the individual level. The validity of the data must therefore be brought into question. The social network method used for data collection, was designed to be used with teams. The use of only one question can be useful if asked to several persons in the same team, however, if used to collect data from only one individual, the single question measure can prove to be quite limited. Analyses were undertaken despite this obvious shortcoming as there was available data.

Individual perceptions of peer justice climate proved to be related to teamwork competencies, with teamwork competencies explaining about 7% of the variance of peer justice climate. The competencies responsible for a relation with overall peer justice were: conflict resolution (explaining 8% variance), communication (explaining 12% variance), and planning and task coordination (explaining 8% of variance). Further insight revealed that specific relations exists between the two variables. The competencies conflict resolution and communication were related to procedural peer justice, whilst the planning and task coordination competency was related to all three dimensions of peer justice (distributive, procedural and interactional). The competencies communication and conflict resolution share some of the same KSAs between them, not to mention the obvious connection that can be made when one considers that conflict resolution requires communication. Thus, a link between these two competencies and fair procedure suggests that persons more competent at communicating and solving problems are likely to enact fair decision-making practices. Similarly, persons who are highly capable in planning and task coordination are likely to reward others fairly (distributive) undertake fair and consistent decision making (procedural) and treat each other in a respectful manner (interactional). These connections can only be made within a context of teamwork processes that draw upon teamwork competencies for their elaboration (Marks et al., 2001).

This being said, a theoretical link between these two competencies and peer justice must consider that the former is a self-report of the frequency of which teamwork behaviours are carried out whilst the latter is based on perceptions of the behaviours of others. With this in mind a person reporting high levels of a peer justice is indicative of a person observing practices that are to be considered fair. For this to be related to teamwork competencies means that persons who are more competent are more likely to observe or consider certain activities as fair. Caution must, however, be exercised when making inferences about these results as the exact reason for the relation is unknown since correlational data does not provide sufficient evidence for causality. There may therefore be one or more unknown 'third variables' that may be responsible for the various relations. Furthermore, the effects observed are quite small and a larger study aimed at improving and replicating results should provide more helpful data for interpretation.

Teamwork Competency Differential

At the individual level, teamwork competencies were found to be related to performance. Teamwork competencies at the group level do not exist, however, this study explores the potential team level effects of teamwork competencies by introducing the teamwork competency differential. The teamwork competency differential is a group level measure of teamwork competencies that is based on the differences in the level of teamwork competencies among persons within the same team. Simply put, the teamwork competency differential demonstrates how similar the levels of competencies are for persons in the same group. Groups with a low teamwork competency differential contain persons with similar levels of knowledge, skills and abilities, whilst groups with a high teamwork competency differential contain a mixture of persons with low and high levels of knowledge, skills and abilities. A low teamwork competency differential is due to a small variance in individual scores, and a high teamwork competency differential is due to a large variance in individual scores. The simplicity of this explanation should not distract from the fact that teamwork competencies may be distributed within a team in a range of ways leading to varying levels of the competency differential.

The teamwork competency differential is likely to have various effects on outcome variables. As teamwork competencies have been so closely related to performance, a link between the teamwork competency differential and team performance was expected. This study also predicted that, within the IMOI framework, either shared leadership or peer justice climate would have a moderating effect on the relation between the teamwork competency differential and team performance. Results indicated that the variables were not related as expected, however, further investigation demonstrated two moderator models within the range of sub-variables. First, procedural peer justice climate had a moderating effect on the relation between the teamwork competency differential for goal setting and performance management and team performance. Second, shared leadership had a moderating effect on the relation between the teamwork competency differential for planning and task coordination and team performance.

In the first instance, where the procedural peer justice climate moderated the relation between the differential in levels of goal setting and performance management and team performance there were

no main effects. The model did, however, contain a significant crossover interaction effect. Moderate levels of procedural peer justice climate did not have any effect on the relation between the differential in levels of goal setting and performance management and performance. Under circumstances where teams had an average perception of the fairness and consistency of decision making within a team (procedural peer justice climate), the relation between the differential for goal setting and performance management and team performance was unaffected. In cases where the procedural peer justice climate was at one standard deviation below average levels, performance was better for teams with a larger differential between team members' levels of goal setting and performance management. In this scenario, when the team environment was perceived to be less fair, a greater difference in goal setting and performance behaviours (due to a larger competency differential) was linked to better performance. On the other hand, a smaller difference in goal setting and performance behaviours (due to a lower competency differential) was linked to worse performance. When the competency differential is interpreted as a sense of how similar team mates are in their levels of knowledge, skills and abilities (KSAs), the results demonstrated that for a instances of low peer justice climate, the more similar teams were in their KSAs, the worse they performed and the more different they were in their KSAs the better they performed. It is important to note that a low score for the teamwork competency differential could reflect several distinct scenarios in which all participants have either high, average or low levels of goals setting and performance management KSAs. Thus further, more specific investigation is required to parse the exact nature of this interaction effect.

On the contrary, when there was a more fair environment due to the level of procedural peer justice climate being one standard deviation above average, performance was worse for teams with higher levels of the teamwork competency differential for goals setting and performance management behaviours. Again, to interpret the competency differential as a sense of how similar team mates are in their levels of KSAs, these results demonstrate that for a instances of high peer justice climate, the more similar teams were in their KSAs, the better they performed and the more different they were in their KSAs the worse they performed. In this scenario, the relation between the teamwork competency differential and team performance seemed to follow a more expected pattern, however, more research is necessary to determine the exact nature of the relation as low levels of the teamwork competency

differential can represent several types of teams. Overall the relations uncovered are quite interesting as the behaviours related to goal setting and performance evaluation were likely to be ones related to the procedure carried out by a team as it attempted to achieve its goals.

In the second model, shared leadership moderated the relation between the differential in levels of planning and task coordination and team performance. The regression model resulted in no main effects, however, as with the previous example, there was a significant crossover interaction effect. Moderate levels of shared leadership did not have any effect on the relation between teamwork competency differential and performance. Thus, under circumstances where teams developed a moderate level of shared leadership, the relation between the planning and task coordination differential and team performance was unchanged. In cases where the level of shared leadership observed was one standard deviation below average levels, performance decreased in teams with a larger differential between team members' levels of planning and task coordination. In this scenario, a larger differential was commensurate with lower performing teams. When the competency differential interpreted as a sense of how similar team mates are in their levels of KSAs, the results demonstrated that for in instances of low levels of shared leadership, the more similar teams were in their KSAs, the better they performed and the more different they were in their KSAs the worse they performed.

On the contrary, when shared leadership was one standard deviation above average, performance was better for teams with higher levels of the differential between team members' levels of planning and task coordination. Likewise, performance was lower for teams with a low differential. Interpreting the competency differential as a representation of how similar team mates are in their levels of KSAs, the results demonstrated that for in instances of high levels of shared leadership, the more similar teams were in their KSAs, the worse they performed and the more different they were in their KSAs the better they performed. Thus, for teams with high levels of shared leadership, similar levels of planning and task coordinating ability, either all high or all low, resulted in worse performance. On the contrary, a mixture of high and low levels of competency for planning and task coordination resulted in better performance.

The data received from the main study was largely exploratory in nature, in that it sought links that had not previously been considered while simultaneously exploring the effects of the teamwork

competency differential. An ideal follow up to this dissertation would be to design another research study that seeks to compare teams with different levels of the teamwork competency differential. In the case of the data at hand, some assumptions can be made to decipher what the data may be showing. Teams with a higher teamwork competency differential are comprised of a mix of persons with levels of teamwork competencies on either end of the spectrum, from low to high. However, teams with a lower teamwork competency differential contain members with all the same level of teamwork competencies; either all high or all low. As average team scores for teamwork competencies (M = 105.85; SD = 6.64) were all above the midpoint of the TWCT scale (Midpoint = 90), it is likely that in the main study, the instances of a low teamwork competency differential represented teams where all the team members possessed an above average level of teamwork competencies.

The inclusion of the average teamwork competency level for each group as a control variable was expected to shed some light on the interaction between the moderator variables (shared leadership and peer justice climate) and the predictor variables (teamwork competency differentials). However, analyses showed that the aggregated teamwork competency scores were not related to team performance. There may be several reasons for the lack of effectiveness of aggregated teamwork competency scores as a predictor of group performance. One key reason may be that at the conceptual level, the average level of teamwork competencies within a team may not be directly related to team performance as there may be several unknown variables such as: team environment, task interdependence, availability of resources etc. which play a larger role in determining team performance. Next, teamwork competencies are interrelated, though distinct constructs, each of these constructs depend on the existence of the others to some degree. The easiest example may be the connection between conflict resolution and communication. These are often closely related in the factor model and even share items on the TWCT. Also, at the practical level it is easy to understand that conflict resolution cannot exist without communication. Likewise, the other teamwork competencies depend on each other for their existence, therefore to include average scores for one particular teamwork competency as a control variable for the model used may have been inadequate and unlikely to show direct effects. The sample size used is another equally important reason for the lack of effectiveness in

using average teamwork competency scores a control variable. The small sample size of 29 groups may not have enough variance to demonstrate any potential relation.

One interesting point for discussion is the similarities between the moderator variables and the teamwork competencies that acted as predictors. For example, the relation between goal setting and performance evaluation and team performance was moderated by procedural peer justice climate. Procedural peer justice climate is based on the fairness of decisions made by team members as well as the consistency of fair decisions. Moderation of performance evaluation has revealed that the procedures for goal setting and performance evaluation may be a key element in team performance. Team members may be especially sensitive to the procedures used by others as pertains to achieving the team's objectives.

In the case of the second model, the relation between planning and task coordination and team performance was moderated by shared leadership. The link between planning and task coordination and leadership is a more direct and obvious one. Shared leadership occurs when two or more individuals share the roles, responsibilities, and functions typically expected of a leader (Day et al. 2004). A connection with planning and task coordination can reflect a similarity between the knowledge, skills and abilities needed for planning and task coordination and the activities that are considered to be the responsibilities of leaders. In short, planning and task coordination are seen as the work of a leader and teams with higher levels of shared leadership seem more likely to demonstrate these competencies.

Conclusion

The dissertation has provided some evidence to support the practice of collecting data related to individual teamwork competency levels before persons engage in teamwork with each other. As teamwork competencies may account for various teamwork processes, teamwork competency development can play a more active part in strategies aimed at improving team outputs that are unrelated to team performance. The teamwork competency differential has also been found to be a useful tool for arranging and establishing teams. As teamwork competencies can be measured before a team is formed, the members with similar levels of teamwork competencies can be placed in the same team, so as to reduce the likelihood of a perceived mismatch of efforts (peer justice climate perceptions). This, in principal, suggests that teams with more homogeneous competency levels (low competency differential) are likely to operate better. However, the data would be better served by an understanding that does not encourage the pursuit of low levels of the teamwork competency differential, but instead one that encourages the avoidance of high levels. Though the healthiest teams may seem to be the ones where the teamwork competency differential is low due to all persons having high levels of teamwork competencies, the more ethical and realistic aim would be to avoid setting up teams with a high teamwork competency differential as this may have adverse effects. Collecting data on teamwork competencies and measuring the teamwork competency differential for each competency proposes a model of team development that starts the training from before the teams work together to ensure a more successful attainment of team outcomes.

Software Engineering Project

The Head of the Department of Computer Sciences indicated that there were internal issues with the teams which participated in the Software Engineering Project course. The concerns were related to the fairness of the team environments and the need for leadership to develop naturally within teams. The results from the investigations have provided several insights into the internal happenings of the student groups involved. First, a change in the levels of teamwork competencies over the eight

weeks of the course implies that the course in its current format, provides an environment for the development of teamwork competencies related to communication and goal setting and performance management. The development of communication is likely to have been related to the course requirement for students to establish contact with each other and express their thoughts and ideas for working on the project. Further development of communication skills would have come through the need to provide reports and documentation for the course assignments. Goal setting and performance management would have likely to be improved through the need to report and present project materials on the course website throughout the period of the course. As far as these competencies go, the Head of Department should seek to continue to use such methods for improving teamwork competencies within the framework of the Software Engineering group project.

With respect to fairness or the peer justice climate, results showed that most teams shared a healthy climate, as average team scores for each of the sub-dimensions (distributive, procedural, interactional) were above the midpoint. Positive scores for overall peer justice perceptions reflect a climate where team members feel respected and fairly treated by their peers. The complaints of unfair division of labour reported by students on prior occasions, seem to be unrelated to fairness within groups. In fact, the ability to complain or voice one's opinion is considered positively as it supports the possibility of fair procedural peer justice. The lowest score of the three peer justice dimensions came from the distributive peer justice climate. This may be an indicator that persons perceived the rewards received as not quite appropriate considering the efforts placed in arriving at the team's goals. As team members are not rewarded by their peers for the work done, the distributive peer justice climate scores may be more of a reflection of the shared reward expected at the end of the course. Thus, relative to the fairness associated with procedures and interactions, participants considered that the current system of grade distribution for the course may be rewarding their peers unfairly for their efforts. More data is needed to investigate these assumptions further. Also, complaints from the teams may be related to other issues unrelated to the peer justice climate.

With respect to the lack of leadership development within teams, the data illustrates that overall shared leadership scores were well below the midpoint despite the existence of a supportive internal team environment. Shared leadership would have been considered to occur when more than one student

shared the role of leader, however, it seems more common that not many students witnessed this type of leadership. One reason may be due to the division of labour built into the Software Engineering group project. The members of each team have an opportunity to divide labour as they choose, however, in many instances tasks were divided based on the roles: design, coding and documentation. These distinct roles encouraged a division of labour that encourages persons to work on their tasks without much input or cooperation from others; as the execution of one task does not require the input of another. A proposal that gives consideration to both the need for conjoint activity and the need to maintain distinct roles, could be to ensure that each team member is given a primary and secondary role within each group. The inclusion of a secondary role (e.g. a student has the primary role of design and the secondary role of coding) means that student groups maintain the orthodox structure of real-world software engineering teams and also have an increased level of conjoint activity. Another proposal for increased shared leadership would be the inclusion of a formal means of coaching by the Head of Department, or the selection of a team leader. The internal team environment for shared leadership was present, however, the lack of any leadership influence whatsoever may have stifled any potential for students to engage in shared leadership activities.

Limitations of Study

The exploratory nature of this study required that several previously unrelated variables be included within the same model for hypothesis testing. One limitation of this approach is that the theoretical origins of each of the included variables may not allow for them to be reduced to being linked to observed behaviour as strongly as this dissertation proposes. Thus, the results found, though they may be significant, must be considered carefully as an example of a case where variables are related as opposed to a clear indication that variables are related. Another major limitation of the study was the number and size of the teams involved. The number of data points provided by the 29 teams involved in this study was far below the number necessary for thorough testing of the proposed models. The use of a larger sample would provide more significant results and larger effect sizes for

consideration. Despite the challenges encountered, the results of the studies within this dissertation provide the doctoral student and the wider research community with a good basis for further investigation into the objectives initially proposed.

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Appendices

Appendices

The following appendices presents an example of some of the materials used for carrying out the various investigations within this dissertation. The various measures presented within these appendices were used to construct the questionnaires used for the preliminary study and the main study. The actual questionnaires were distributed online using the software *Google Forms.*

The following materials are included:

- Informed Consent Form
- Demographic Questionnaire
- Teamwork Competency Test (TWCT)
- Peer Justice Climate Questionnaire (PJCQ)
- Measure of Internal Team Environment
- Shared Leadership Measure (Social Network approach)

Appendix I - Informed Consent Form

What Is The Research About?
You are being invited to take part in a research study about your personal experiences whilst working in a group of peers. If you take part in this study, you will be one of about 300 people to do so.

Who Is Doing The Study?
The person conducting this study is Blaine Marcano, a PhD student of the Complutense University of Madrid, Spain. There may be other people on the research team assisting at different times during the study.

What Is The Purpose Of This Study?
This brief survey asks students to draw upon their personal experience of working in groups so that we can learn which issues are most frequent among undergraduate students.

Where Is The Study Going To Take Place And How Long Will It Last?
This research will be conducted at various university campuses across Trinidad and Tobago including the University of the West Indies (UWI), The University of the Southern Caribbean (USC) and the University of Trinidad and Tobago (UTT). The survey will take about 15 - 20 minutes.

What Will I Be Asked To Do?
You are required to answer all questions honestly by either selecting or circling the option that BEST represents your response.

What Are The Possible Risks And Discomforts?
To the best of our knowledge, the things you will be doing have no more risk of harm than you would experience in everyday life.

Do I Have To Take Part In This Study?
If you decide to take part in the study, it should be because you really want to volunteer. There will be no penalty and you will not lose any benefits or rights you would normally have if you choose not to volunteer. Even if you decide to take part in the study, you still have the right to decide at any time that you no longer want to continue. No one on the research team will behave any differently toward you if you choose not to participate in the study or not to continue after you have begun.

What Will It Cost Me To Participate?
There are no costs associated with taking part in this study.

Will I Benefit From Taking Part In This Study?
You will not get any personal benefit from taking part in this study.

Who Will See The Information I Give?
Your information will be combined with information from other people taking part in the study. When we write up the study to share it with other researchers, we will write about the combined information. You will not be identified in any published or presented materials.

What If I Have Questions?
Before you decide whether or not to participate in the study, please ask any questions that come to mind now. Later, if you have questions about the study, you can contact the investigator Blaine Marcano at (868) 308-2966. If you have any questions about your rights as a research participant, contact Dr. Susan Chand (chands@usc.edu.tt), Chair of the Research Department.

What Else Do I Need To Know?
I am required to provide you with a copy of this informed consent form. Signing this form gives the researcher permission to use your data. It cannot be requested to be excluded at a later time.

Research Participant Statement and Signature

I understand that my participation in this research study is entirely voluntary. I may refuse to participate without penalty or loss of benefits. I may also stop participating at any time without penalty or loss of benefits.

_____ _____
Signature of person consenting to take part in the study — Date

_____
Printed name of person consenting to take part in the study

_____ _____
Name of person providing information to the participant — Date

Appendix II - Demographic questionnaire

1. Age: _____ 2. Sex: ☐Male ☐Female

3. Ethnicity:
☐ Mixed
☐ East-Indian
☐ African
☐ Other *(please specify)*
_____

4. Work Experience:_____years

☐ less than one year

5. Grade Point Average (GPA) as of last semester: _____

Appendix III - Teamwork Competency Test (TWCT)

(Aguado, Rico, Sánchez-Manzanares & Salas, 2014)

1. When my work team is in conflict, I try to make it explicit to find solution pathways.[1]

1	2	3	4
Almost never/Never	Rarely	Often	Almost always/Always

2. When I interact with my teammates, I ask questions to better understand what they say.
3. When I disagree with others, I make an effort to focus on what we have in common instead of centering on what separates us.
4. I plan my tasks effectively.
5. I try to use the most appropriate team network to communicate the different types of information, avoiding the same formal procedure all the time.[2]
6. I often get involved in monitoring the task performance of other team members.
7. When we face an internal conflict because of a communication problem or misunderstanding, I try to solve it by asking questions and listening to the people involved.
8. I look at people when they talk to me and I modify my body language to show real interest in what they tell me.
9. I can easily recognize people's emotional states by observing their nonverbal messages.
10. If someone in my team acts inappropriately, I talk privately with her/him, encouraging the rest of the team to do the same.
11. To address the trivial task-related issues, I do not need to talk first with all team members so we reach a decision.[3]
12. I make an effort to talk about less important things with my peers for the sake of team spirit and better internal communication.

[1] Replaced with "When my team is in conflict, I try to state problems clearly to find pathways to a solution."
[2] Replaced with: "I try to use the most appropriate method of contact to communicate different types of information with other team members, avoiding the same formal procedure all the time."
[3] Replaced with "To address trivial task-related issues, I do not need to consult first with all team members for a decision"

13. Having knowledge about people's skills and situation requirements is critical to assign tasks properly.[4]
14. Discussions without directions or guides can lead group members to make decisions that they would not make on their own.
15. When my personal interests are in conflict with others' interests, I tend to be honest in the negotiation so that others understand my needs.[5]
16. I care and act to make team conflicts explicit in a way that they can be solved.
17. I play an active role in team meetings by offering my opinions, asking questions, and expressing my thoughts and ideas in a sincere and open way.
18. I often help others in my team to make clear the roles and tasks they have to perform.
19. When I am upset about something, I express my discomfort to the group in a constructive way, asking for solution alternatives.
20. I like to provide my peers with feedback about what they do and to assess and value their work.
21. If something upsets me in my team, I do not like to act as if nothing has happened.
22. I try to establish milestones in my work team so that we can monitor our assigned tasks.
23. When I am involved in a team project, I care about having clear plans concerning the tasks and the timing to accomplish them.
24. During group meetings, regulation is necessary to ensure that all members provide their opinions and to avoid that only a few participate actively.
25. When performing tasks in which one is an expert, the contributions made by other members are not that important.
26. In group decision meetings, it is more usual to promote cohesion and reach a majority agreement than to pay attention to divergent opinions.
27. I try listening to my peers' opinions without evaluating their positions as good or bad.
28. When working in a group, I say what I think in an open and sincere way.

[4] Replaced with "Having knowledge about people's skills and situational requirements is critical for proper task assignment."
[5] Replaced with "When my personal interests are in conflict with others' interests, I tend to be honest in the negotiation process so that others understand my
needs."

29. I expect my peers trust enough to tell me the aspects of my work that they most dislike.
30. I sometimes talk with my peers without an objective, just for sharing a while together.
31. It is important for me to monitor the tasks assigned to each team member.
32. I provide my peers with relevant information on how well I think the team tasks are progressing.
33. When doing my job, I prioritize the tasks most necessary for my teammates to complete their work.
34. I try to ensure that my outputs match the inputs needed by my peers to perform their tasks.
35. For the sake of teamwork, I set objectives with moderate difficulty so that effort is needed to accomplish them.
36. I often provide my peers with feedback on their task performance.

Appendix IV - Peer Justice Climate Questionnaire (PJCQ)

(Li, Cropanzano, and Benson, 2007)

Please respond to each of the following statements by circling the number that best represents how much you personally agree or disagree with these statements.

1. Some of my teammates have received a better grade for the first half of this course than they would have deserved

1	2	3	4	5
Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree

2. The grade that my teammates have received for the first half of this course is appropriate considering the quality of the work they have completed.

3. Some of my teammates did not do their share of the work, even though we have all received the same grade for the first half of the course.

4. Some of my teammates did not meet their responsibilities, even though we have all received the same grade for the first half of the course.

5. Some of my teammates put forth much less effort than other members of my team, even though we have all received the same grade for the first half of the course.

6. My teammates are able to express their views and feelings about the way decisions are made in the team

7. The way my teammates make decisions is free from personal bias.

8. My teammates ignore each other's inputs to the project.

9. My teammates use correct information for the course project.

10. The way my teammates make decisions is applied consistently.

11. My teammates help each other out.

12. My teammates argue with each other.

13. My teammates put each other down.

14. My teammates treat each other with respect.

Appendix V - Measure of Internal Team Environment

(Carson, Tesluk & Marrone, 2007)

Please respond to each of the following statements about the way you interact with your teammates by circling the number that best represents how much you personally agree or disagree with these statements.

The members of my team . . .

1. Spent time discussing our team's purpose, goals, and expectations for the project.

1	2	3	4	5
Strongly Disagree	Disagree	Neither disagree nor agree	Agree	Strongly Agree

2. Discuss our team's main tasks and objectives to ensure that we have a fair understanding.
3. Devise action plans and time schedules that allow for meeting our team's goals.
4. Talk enthusiastically about our team's progress.
5. Recognize each other's accomplishments and hard work.
6. Give encouragement to team members who seem frustrated.
7. People in this team are encouraged to speak up to test assumptions about issues under discussion.
8. As a member of this team, I have a real say in how this team carries out its work.
9. Everyone on this team has a chance to participate and provide input.
10. My team supports everyone actively participating in decision-making.

Appendix VI - Shared Leadership (Social Network approach)

(Carson, Tesluk & Marrone, 2007)

Please answer the following question about each of your teammates using a scale of 1 to 5, where 1 = 'not at all' and 5 = 'to a very great extent'.

1. To what degree does your team rely on this individual for leadership?

Team member 1 = _____

Team member 2 = _____

Team member 3 = _____

Team member 4 = _____

Team member 5 = _____